SESSION 2

APPLICATION PROGRAMS

FLOYD WORKMON

SECTION 2.1

INTRODUCTION

- JOINT SOFTWARE GROUP

  - LEGAL BOUND
    * TRAFFIC SIGNAL CONTROL PROGRAMS APPLICATION
    * CALTRANS, TEXAS DOT, LA CITY, IRVINE CITY

- AVAILABLE OPEN MARKET PROGRAM

SESSION 2.2

AGENCY LOCAL INTERSECTION PROGRAM

GEORGE CHEN

Type 2070 Controller Software
By City of Los Angeles

Traffic Signal Control Program (TSCP)
Transit Priority System (TPS)
Startup Manager

Traffic Signal Control Program (TSCP) Overview

Installation

- 500 installed city-wide since 1997
- Used transit priority control intersections
- Used in complex intersection's traffic signal operations
- Used in CDPD communications enabled intersections

Enhancement to current ATSAC and ATCS systems in LADOT

- Compatible with existing infrastructures
- 16 System detectors per controller
- Communicate with UTCS systems
- Integrate with Light Rail System

LADOT Moving LA Forward

TSCP Software Features

Signal Control

- Eight-phase, dual-ring operation
- Restricted phase operation
- Six overlap with programmable parent, omit and no-start phases
- Programmable detector inputs and load-switch outputs
- Pedestrian service on all phases
- Volume density operation
- User programmable software logic
- Local Critical Intersection Control (CIC)

Coordination

- Nine local plans
- Four “On-Line” ATSAC plans
- Free and Flash operation
- Lead-lag operation by plan
- Sync phase, hold phase, and phase omit by plan
- 7-wire and Simplex modem master and slave operation
- Complex modem master and slave operation
- Plan verification prior to operation

LADOT Moving LA Forward

TSCP Software Features Continued

Time-of-Day

- Separate control for Time-of-Day functions and plan selection
- Six plan selection tables, each with 16 plan entries
- 16 fixed and 16 floating holidays
- Extensive “look-back” feature for plan selection
- Automatic Daylight Saving correction
- Solar clock and Hebrew calendar for sabbatical pedestrian recall

Detectors

- 32 programmable detectors (vehicle, bicycle or pedestrian)
- Up to 16 system detectors
- Vehicle detectors assignable to both phase and function
- Count, delay and extend timing on all detectors
- Red and yellow lock by detector
- Failure monitoring with automatic phase recall
- Failure recall times by detector

LADOT Moving LA Forward

TSCP Software Features Continued

Communications

- Compatible with ATSAC system
- Compliant with AB3418 protocol
- Supports external WWV time clock
- Compatible with simplex modem system (master and slave)
- New complex modem system (master and slave) with time and plan
- High speed EIA-232 (up to 38.4K bps)
- Programmable parity, data and stop bits

Preemption

- Two railroad and four emergency vehicle preempts
- Latching or non-latching preempt inputs
- Fully programmable delay, clearance, hold and exit phases and overlaps
- Three clearance intervals for railroad preempts
- Maximum emergency vehicle preempt timer

Transit Priority

- Programmable green extension and early green
- Programmable number of inhibit cycles
- Priority phase hold during free operation

Diagnostics and Utilities

- Event logging of all special conditions
- Input, output display and keyboard tests
- RAM checksums for each timing chart page
- Copy feature for phase timing, local plans, time-of-day tables and transit priority data

TSCP Operations

Main Menu:

```
                TSCP MAIN MENU
 1-Displays    4-Commands    7-Coordination
 2-Controller  5-Detectors   8-TOD Schedule
 3-Preemption  6-Comm/Logic  9-Utilities
```

Phase Timing Display:

```
                 PHASE TIMING            Pg 1/2
Phs   Interval    Time   Max  |     Demand
 2   GREEN REST    0.0    20  | VEH .2...6..
 6   GREEN REST    0.0    20  | PED ........
```

Communications Menu:

```
          COMMUNICATIONS DISPLAY
1-ATSAC Protocol     4-AB3418 Status
2-Simplex Protocol   5-WWV Protocol
3-Complex Protocol
```

Detector Menu:

```
           DETECTOR DISPLAY MENU
 1-Vehicle Counts     4-Failed Detectors
 2-Delay Timers       5-System Det Data
 3-Extend Timers
```

TSCP Operations

Utility:

```
                RAM CHECKSUM
   Page 2 = XXXX          Page 4 = XXXX
   Page 3 = XXXX          Page 5 = XXXX
    Pages referenced to Timing Chart
```

Cabinet Configuration:

```
    CABINET STATUS INPUT CONFIGURATION
    Input      Port         Input      Port
 Flash Bus    ›2.8‹     Flash Sense    6.7
 Door Ajar     6.1       Stop Time     6.8
```

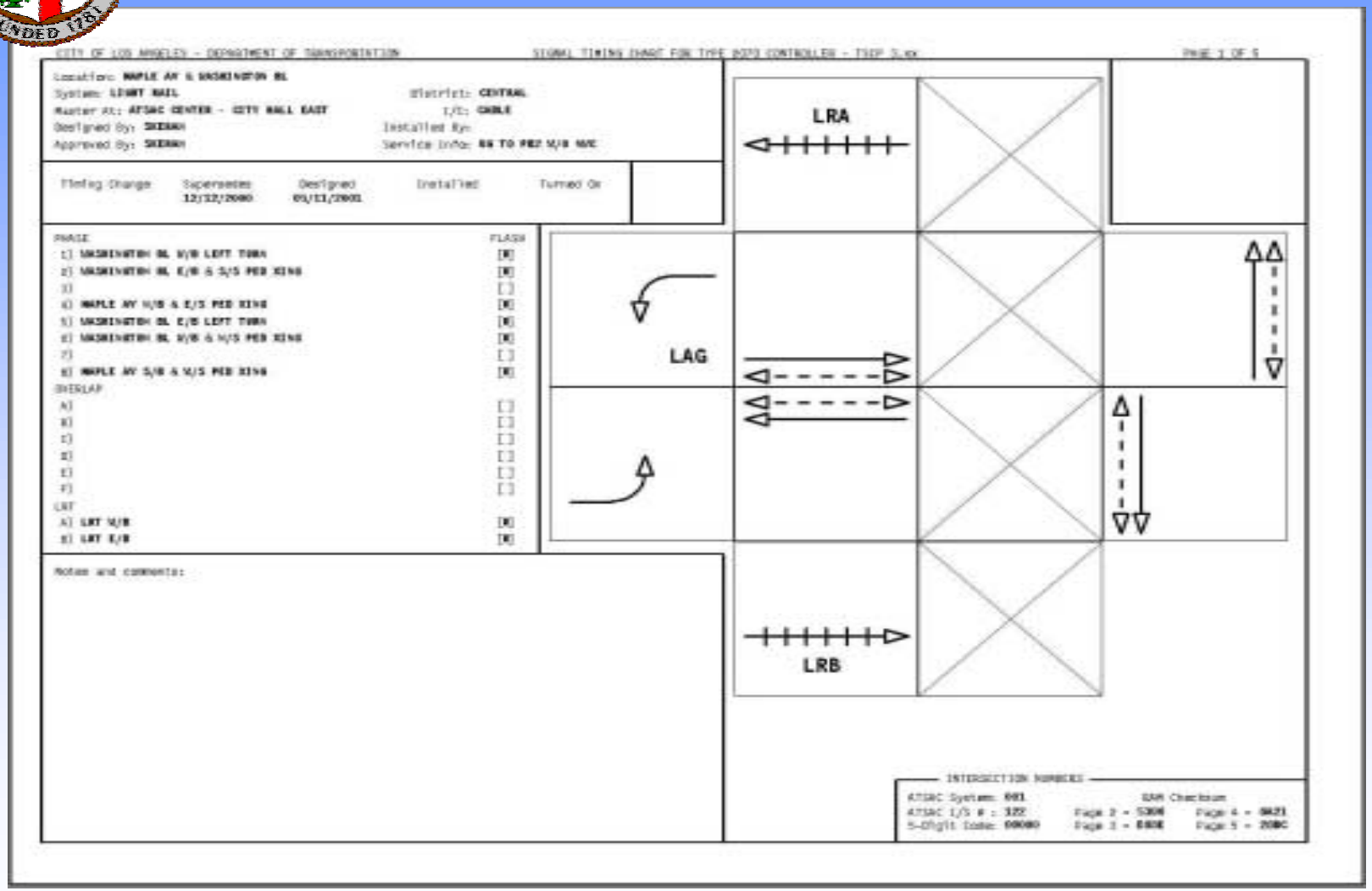
CIC Menu:

```
                CIC  PARAMETERS
1-CIC Enable
2-CIC Parameter Values
3-Detector-to-Phase Assignment
```

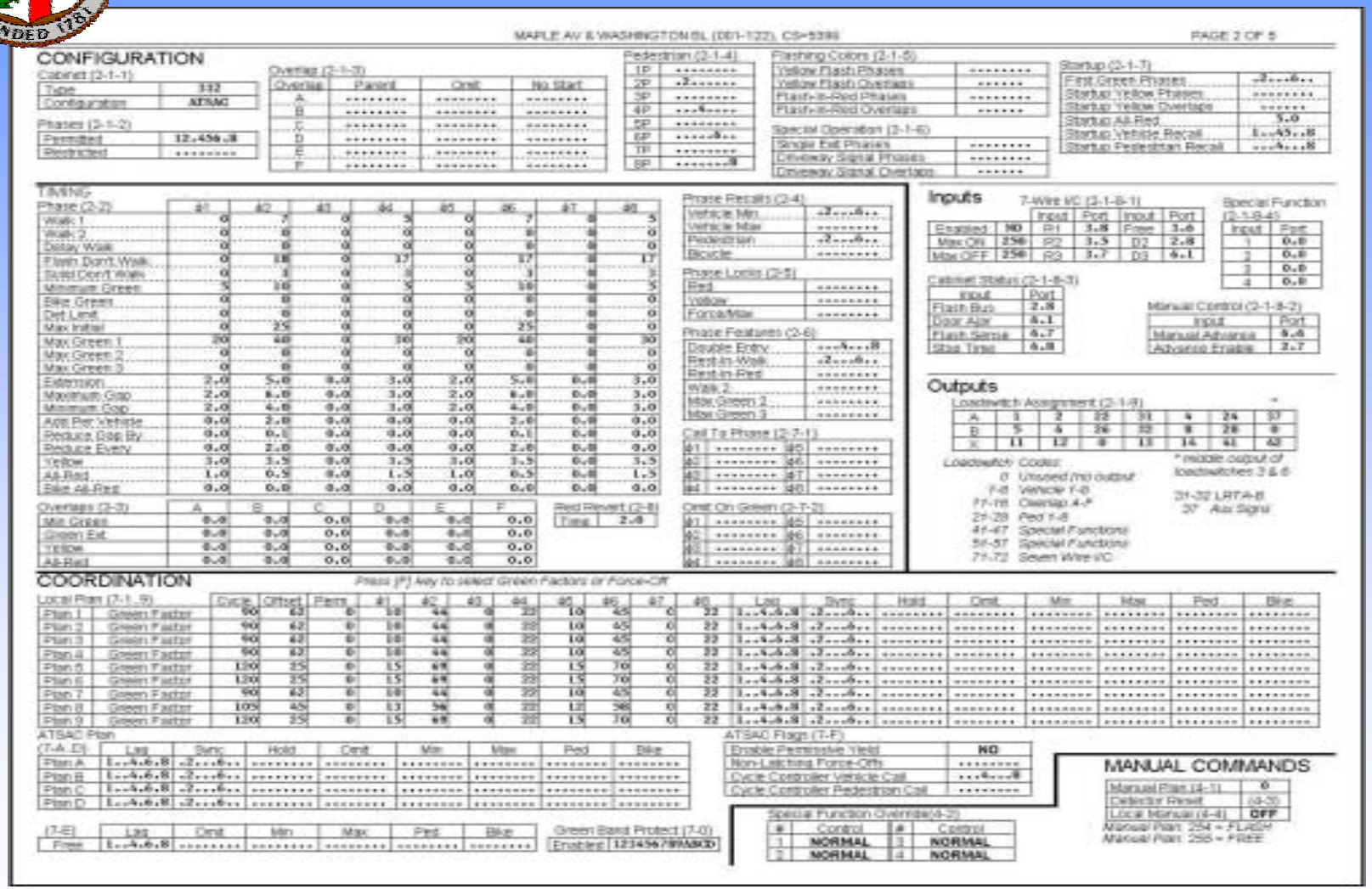
Solar Clock Menu:

```
              SOLAR CLOCK DATA
North Latitude  › 34‹      Today's Times
West Longitude   118     Sunrise 05:38:10
Local Time Zone    8     Sunset  16:52:14
```

TSCP Timing Chart



TSCP Timing Chart



MAPLE AV & WASHINGTON BL (DD1-122), CS=5388 — PAGE 2 OF 5

CONFIGURATION

Cabinet (2-1-1)

Type	332
Configuration	ATSAC

Phases (2-1-2)

Permitted	12,456,8
Restricted	.....

Overlap (2-1-3)

Overlap	Parent	Omit	No Start
A	.....	.....	.....
B	.....	.....	.....
C	.....	.....	.....
D	.....	.....	.....
E	.....	.....	.....
F	.....	.....	.....

Pedestrian (2-1-4)

1P	.....
2P	.2.....
3P	.....
4P	...4.....
5P	.....
6P	.....6...
7P	.....
8P	8

Flashing Colors (2-1-5)

Yellow Flash Phases	.....
Yellow Flash Overlaps	.....
Flash-In-Red Phases	.....
Flash-In-Red Overlaps	.....

Special Operation (2-1-6)

Single Exit Phases	.....
Driveway Signal Phases	.....
Driveway Signal Overlaps	.....

Startup (2-1-7)

First Green Phases	.2....6...
Startup Yellow Phases	.....
Startup Yellow Overlaps	.....
Startup All-Red	5.0
Startup Vehicle Recall	1...45...8
Startup Pedestrian Recall	...4....8

TIMING

Phase (2-2)

	#1	#2	#3	#4	#5	#6	#7	#8
Walk 1	0	7	0	5	0	7	0	5
Walk 2	0	0	0	0	0	0	0	0
Delay Walk	0	0	0	0	0	0	0	0
Flash Don't Walk	0	18	0	17	0	17	0	17
Solid Don't Walk	0	1	0	1	0	1	0	1
Minimum Green	5	10	0	5	5	10	0	5
Bike Green	0	0	0	0	0	0	0	0
Det Limit	0	0	0	0	0	0	0	0
Max Initial	0	25	0	0	0	25	0	0
Max Green 1	20	40	0	30	20	40	0	30
Max Green 2	0	0	0	0	0	0	0	0
Max Green 3	0	0	0	0	0	0	0	0
Extension	2.0	5.0	0.0	3.0	2.0	5.0	0.0	3.0
Maximum Gap	2.0	8.0	0.0	3.0	2.0	8.0	0.0	3.0
Minimum Gap	2.0	4.0	0.0	3.0	2.0	4.0	0.0	3.0
Add Per Vehicle	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0
Reduce Gap By	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
Reduce Every	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0
Yellow	3.0	3.5	0.0	3.5	3.0	3.5	0.0	3.5
All-Red	1.0	0.5	0.0	1.5	1.0	0.5	0.0	1.5
Bike All-Red	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlaps (2-3)

	A	B	C	D	E	F
Min Green	0.0	0.0	0.0	0.0	0.0	0.0
Green Ext	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	0.0	0.0	0.0	0.0	0.0	0.0
All-Red	0.0	0.0	0.0	0.0	0.0	0.0

Red Rest (2-8)

Ring	2.0

Phase Recalls (2-4)

Vehicle Min	.2....6...
Vehicle Max	.....
Pedestrian	.2....6...
Bicycle	.....

Phase Locks (2-5)

Red	.....
Yellow	.....
Force/Max	.....

Phase Features (2-6)

Double Entry	...4....8
Rest-In-Walk	.2....6...
Rest-In-Red	.....
Walk 2	.....
Max Green 2	.....
Max Green 3	.....

Call To Phase (2-7-1)

#1	.....	#5	.....
#2	.....	#6	.....
#3	.....	#7	.....
#4	.....	#8	.....

Omit On Green (2-7-2)

#1	.....	#5	.....
#2	.....	#6	.....
#3	.....	#7	.....
#4	.....	#8	.....

Inputs

7-Wire I/C (2-1-8-1)

	Input	Port	Input	Port
Enabled	NO	P1	3.8	Flash	3.6
Max ON	250	P2	3.5	D2	2.8
Max OFF	250	P3	3.7	D3	4.1

Special Function (2-1-8-4)

Input	Port
1	0.0
2	0.0
3	0.0
4	0.0

Cabinet Status (2-1-8-3)

Input	Port
Flash Bus	2.8
Door Ajar	4.1
Flash Sense	4.7
Stop Time	4.8

Manual Control (2-1-8-2)

Input	Port
Manual Advance	4.6
Advance Enable	2.7

Outputs

Loadswitch Assignment (2-1-9)

A	1	2	22	31	4	24	37
B	5	6	26	32	8	28	8
X	11	12	0	13	14	41	42

Loadswitch Codes:
0 Unused (no output)
1-8 Vehicle 1-8
11-18 Cleanup 4-P
21-28 Ped 1-8
41-47 Special Functions
51-57 Special Functions
71-72 Seven Wire I/C

* inside output of loadswitches 3 & 6

31-32 LRTA-8
37 Aux Signal

COORDINATION

Press [F] key to select Green Factors or Force-Off

Local Plan (7-1-9)		Cycle	Offset	Perm	#1	#2	#3	#4	#5	#6	#7	#8	Lag	Sync	Hold	Omit	Min	Max	Red	Bike
Plan 1	Green Factor	90	42	0	18	44	0	28	10	45	0	32	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan 2	Green Factor	90	42	0	18	44	0	28	10	45	0	32	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan 3	Green Factor	90	42	0	18	44	0	28	10	45	0	32	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan 4	Green Factor	90	42	0	18	44	0	28	10	45	0	32	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan 5	Green Factor	120	35	0	15	68	0	22	15	70	0	22	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan 6	Green Factor	120	35	0	15	68	0	22	15	70	0	22	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan 7	Green Factor	90	42	0	18	44	0	28	10	45	0	32	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan 8	Green Factor	105	45	0	13	56	0	28	12	58	0	22	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan 9	Green Factor	120	35	0	15	68	0	22	15	70	0	22	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....

ATSAC Plan

(7-A-D)	Lag	Sync	Hold	Omit	Min	Max	Red	Bike
Plan A	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan B	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan C	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....
Plan D	1...4.6.8	.2....6...	.....	.....	.....	.....	.....	.....

ATSAC Flags (7-F)

Enable Permissive Yield	NO
Non-Latching Force-Offs	.....
Cycle Controller Vehicle Call	...4....8
Cycle Controller Pedestrian Call	.....

(7-E)	Lag	Omit	Min	Max	Ped	Bike
Free	1...4.6.8	.....	.....	.....	.....	.....

Green Band Protect (7-0)

Enabled	12345678ABCD

Special Function Overrides(4-2)

#	Control	#	Control
1	NORMAL	3	NORMAL
2	NORMAL	4	NORMAL

MANUAL COMMANDS

Manual Plan (4-1)	0
Detector Reset	(4-3)
Local Manual (4-4)	OFF

Manual Plan: 254 = FLASH
Manual Plan: 255 = FREE

Transit Priority System (TSP) Overview

Installation

- Two transit corridors in the City
- 212 TPS traffic signals installed city-wide since 2000

Enhancement to current TSM systems in LADOT

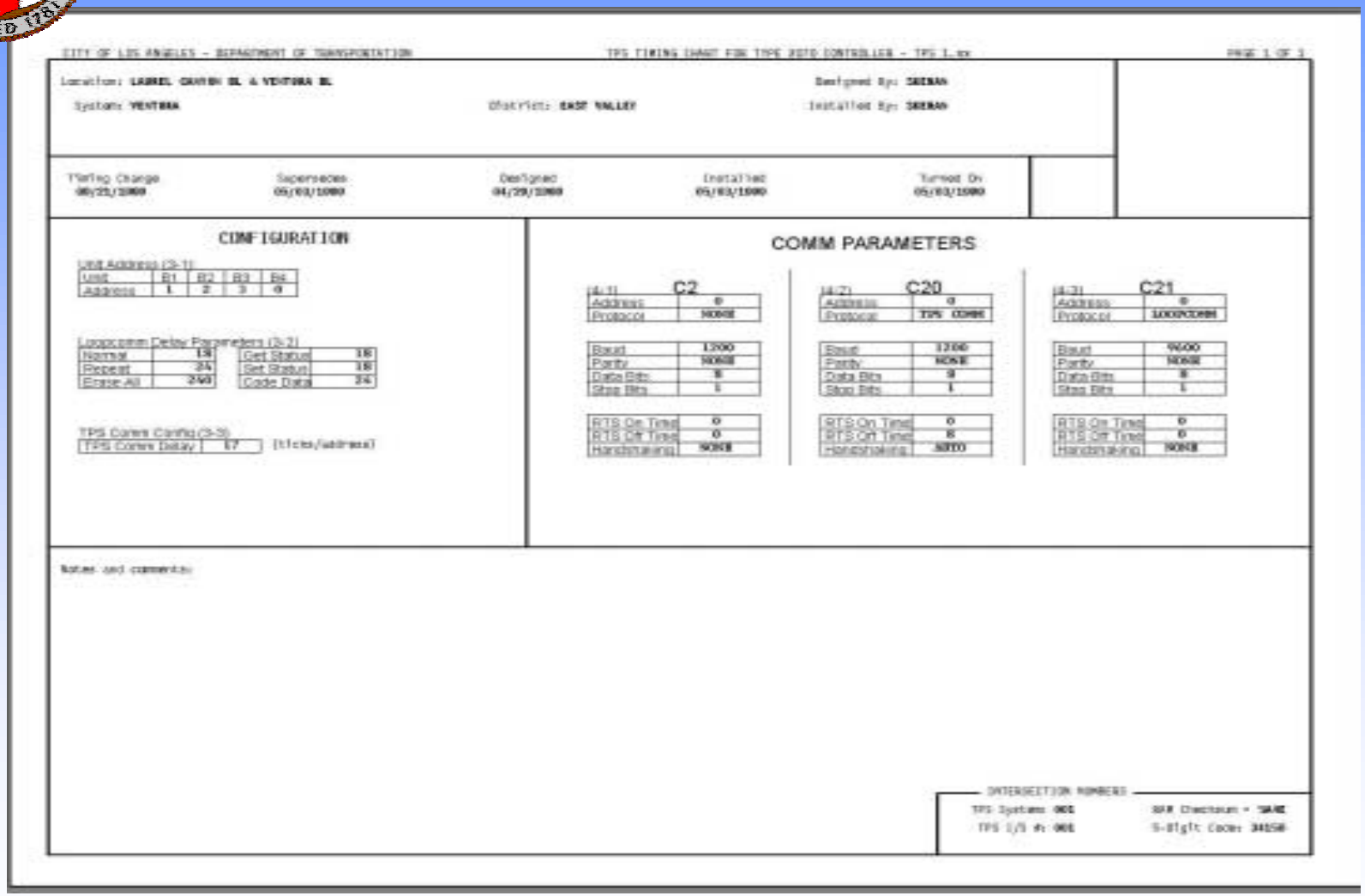
- Provide Traffic Signal Priority to MTA Rapid Buses
- Plan to Provide Traffic Signal Priority to Fire Department Vehicles
- No additional transition required after priority operation
- Priority response within one second of detection
- Early green, Green extension, and Phase hold priority mode

LADOT Moving LA Forward

TPS Software Features

- User configurable priority parameters
- Communicates with up to four transponder detector units
- Automatic detector unit failure monitoring
- Support for detector unit configuration
- Detection simulation
- Valid transponder code programming
- High speed serial communications
- RAM check for timing chart data
- Configurable communications port

TPS Timing Chart



CITY OF LOS ANGELES – DEPARTMENT OF TRANSPORTATION — TPS TIMING CHART FOR TYPE 2070 CONTROLLER – TPS 1.xx — PAGE 1 OF 3

Location: LAUREL CANYON BL & VENTURA BL — Designed By: SEEBAN

System: VENTURA — District: EAST VALLEY — Installed By: SEEBAN

Timing Change	Supersedes	Designed	Installed	Turnout On
08/25/1999	05/03/1999	04/29/1999	05/03/1999	05/03/1999

CONFIGURATION

Unit Address (3-1)

Unit	B1	B2	B3	B4
Address	1	2	3	0

Loopback/min Delay Parameters (3-2)

Normal	18	Get Status	18
Repeat	24	Set Status	18
Erase All	240	Code Data	24

TPS Comm Config (3-3)

TPS Comm Delay	17	(ticks/address)

COMM PARAMETERS

(4-1) C2	
Address	0
Protocol	NONE
Baud	1200
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	0
RTS Off Time	0
Handshaking	NONE

(4-7) C20	
Address	0
Protocol	TS% COMM
Baud	1200
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	0
RTS Off Time	0
Handshaking	XOFF

(4-2) C21	
Address	0
Protocol	1000COMM
Baud	9600
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	0
RTS Off Time	0
Handshaking	NONE

Notes and comments:

INTERSECTION NUMBERS

TPS System: 001 — SAM Checksum = SAME

TPS I/O #: 001 — 5-Digit Code: 34150

Startup Manager

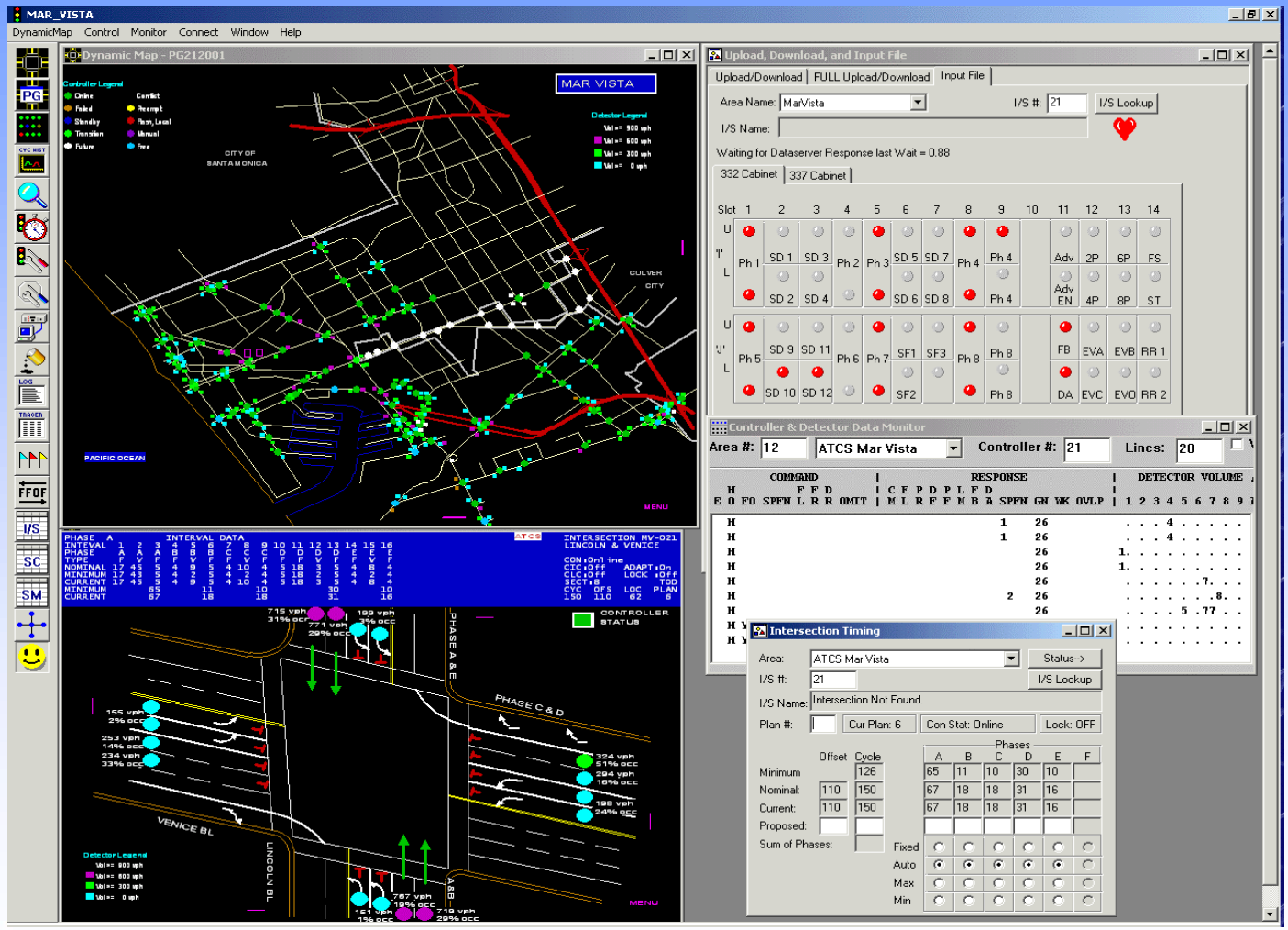
Select 2070 Startup Sequence

Save New Startup Sequence

Enable New Startup Sequence

TSCP and ATCS

Integration with LADOT Adaptive Traffic Control System



TPS and TMS

Integration with LADOT Transit Management System

City of Los Angeles
Department of Transportation

George E. Chen
ATSAC Center
221 North Figueroa Street, Suite 300
Los Angeles CA, 90012

LADOT
Moving LA Forward

SESSION 2.3

TRAFFIC SIGNAL CONTROL PROGRAM (TSCP)
and
UNIVERSAL RAMP METERING (URMS)

HERASMO INIGUEZ

URMS

-Legacy Support
-Network Communication
-Ramp Metering Algorithm
(selection/options)
-Distributed Program
-Modular Design
-100% URMS Operational Requirements
-Incorporates a URMS Application Program Interface (API)

-LEGACY SUPPORT

-SATAMS and SDRMS Framing

-Transparent to Legacy FEP Data Capabilities

-NETWORK COMMUNICATIONS

-Uses Industry Standard RPC Libraries BSD Ver 4.3

-Utilizes Client/Server Paradigm

-Utilizes Microwares Stacked Protocol File Manager (SPF)

RAMP METERING ALGORITHM

-San Diego Ramp Metering (SDRMS)

-Stubs for Industry Metering

-DISTRIBUTED PROGRAM

-Client/Server Design using TCP/IP

-MODULAR DESIGN

-Multi-Process Program

-Each Process is stand Alone Capable

-Each Program has Built-in Debugging

-Module Selectable Configuration File

-Modules Included:

Surveillance, Front Panel,Metering, Field I/O, SDRMS, SATMS, Network

-URMS OPERATIONAL REQUIREMENTS

-Designed Around Operational Requirements

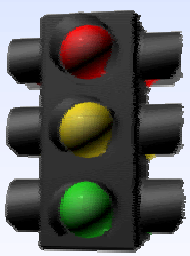
-URMS API

-Implements an API Utilizing Standard RPC Definitions

-Interfaces without URMS Code changes

SESSION 2.4

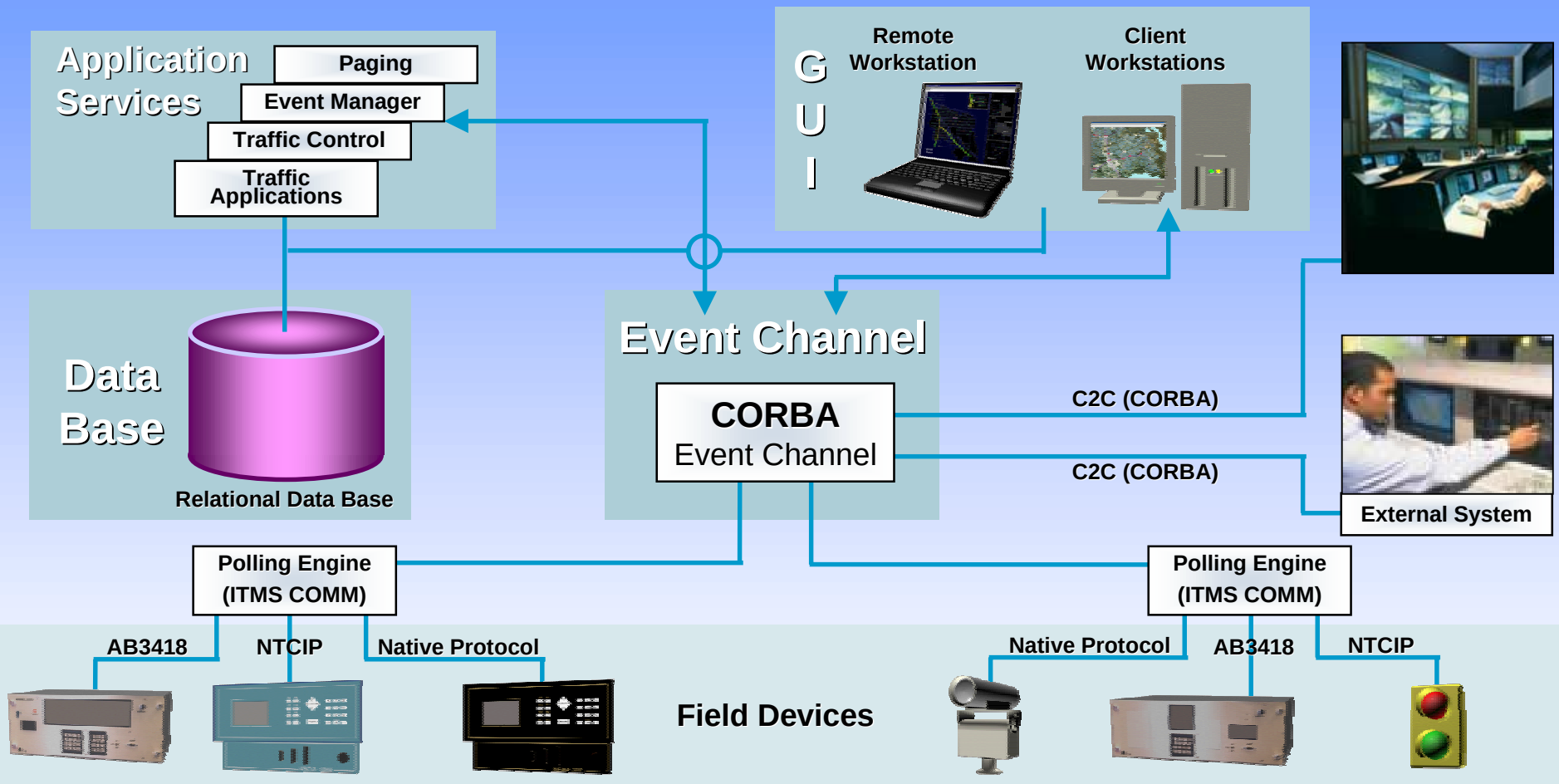
2070's @
2002 Winter Olympics
Salt Lake City



Craig Gardner

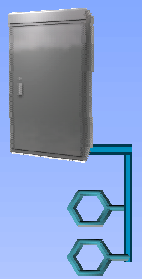
Salt Lake City
ATMS

ATMS Architecture



SLC ATMS
2070 APPLICATIONS

- **Freeway Surveillance**
- **Ramp Metering**
- **Light Rail Transit (LRT) Signal Priority**



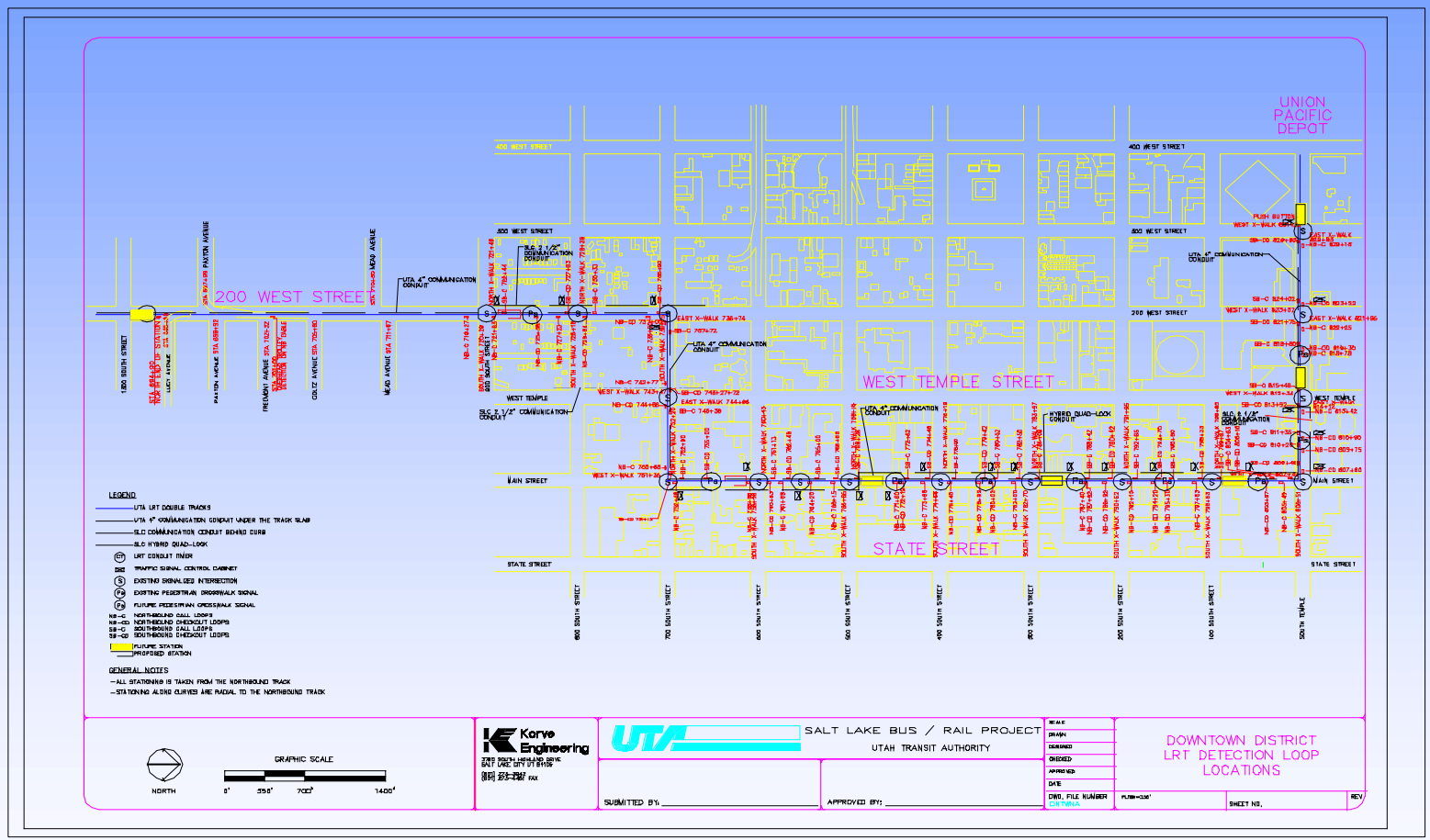
Freeway Surveillance

- **Approx. 250 Mainline Stations**
- **Lanes Instrumented w/ Inductive Loops**
- **20 or 30 second Polling by Central ATMS**
  - Lane Volumes, Occupancies & Avg. Speeds
- **Data Bin Processing**
  - Speed Distributions
  - Vehicle Length Distributions
  - 5 min to 24 hr periods

RAMP METERING

- Approx. 25 Currently Active Meters
- Traffic Responsive, TOD, or Central Algorithm Rate Selection
- NTCIP Compliance (Objects & Comm.)

SLC LRT Signal Priority



1300 South Station

700 S & 200 W – Around the Corner

Main St.

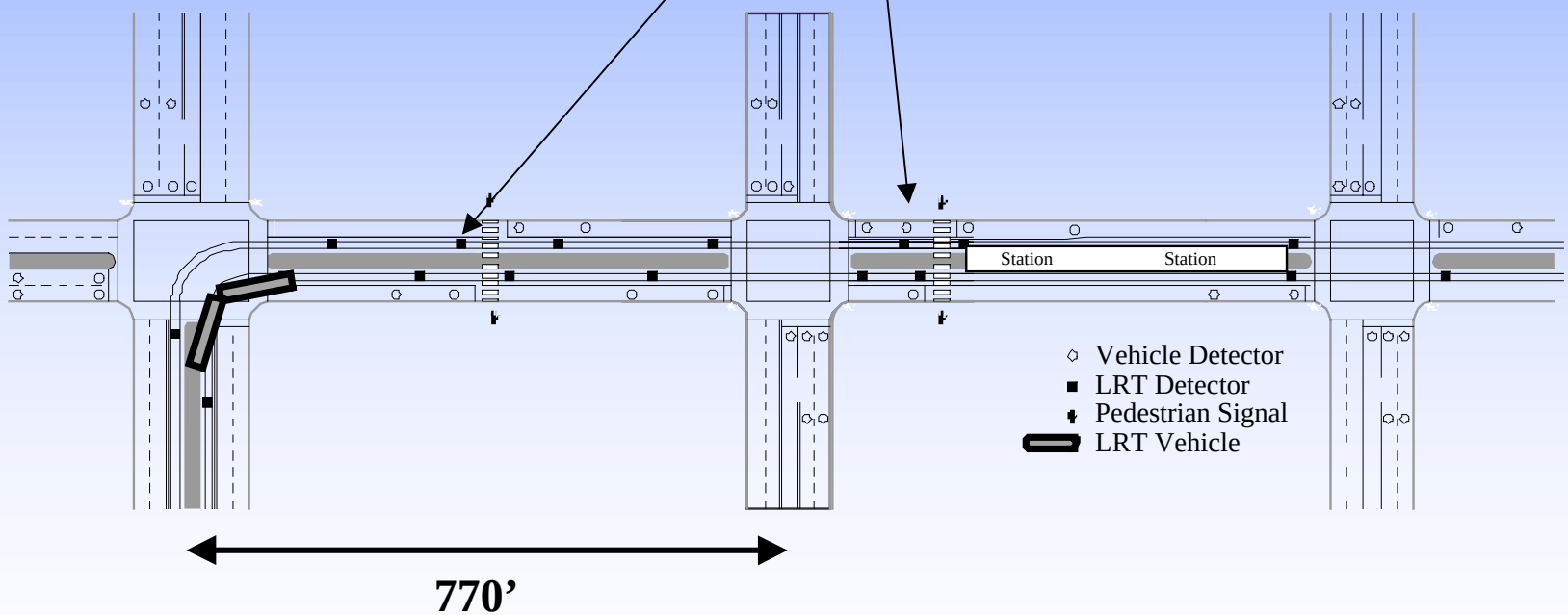
LRT ATMS Requirements

- LRT progression along route (both directions)
- Maintain coordinated signal operations
- Provide LRT queue jump at start of phase
- LRT Signals - flash GO for clearance (6 flash + 3 RED)
- Provide “greenband” countdown timers at end-stations
- Operate as an integrated component of ATMS
- Utilize agency standard cabinets/equipment

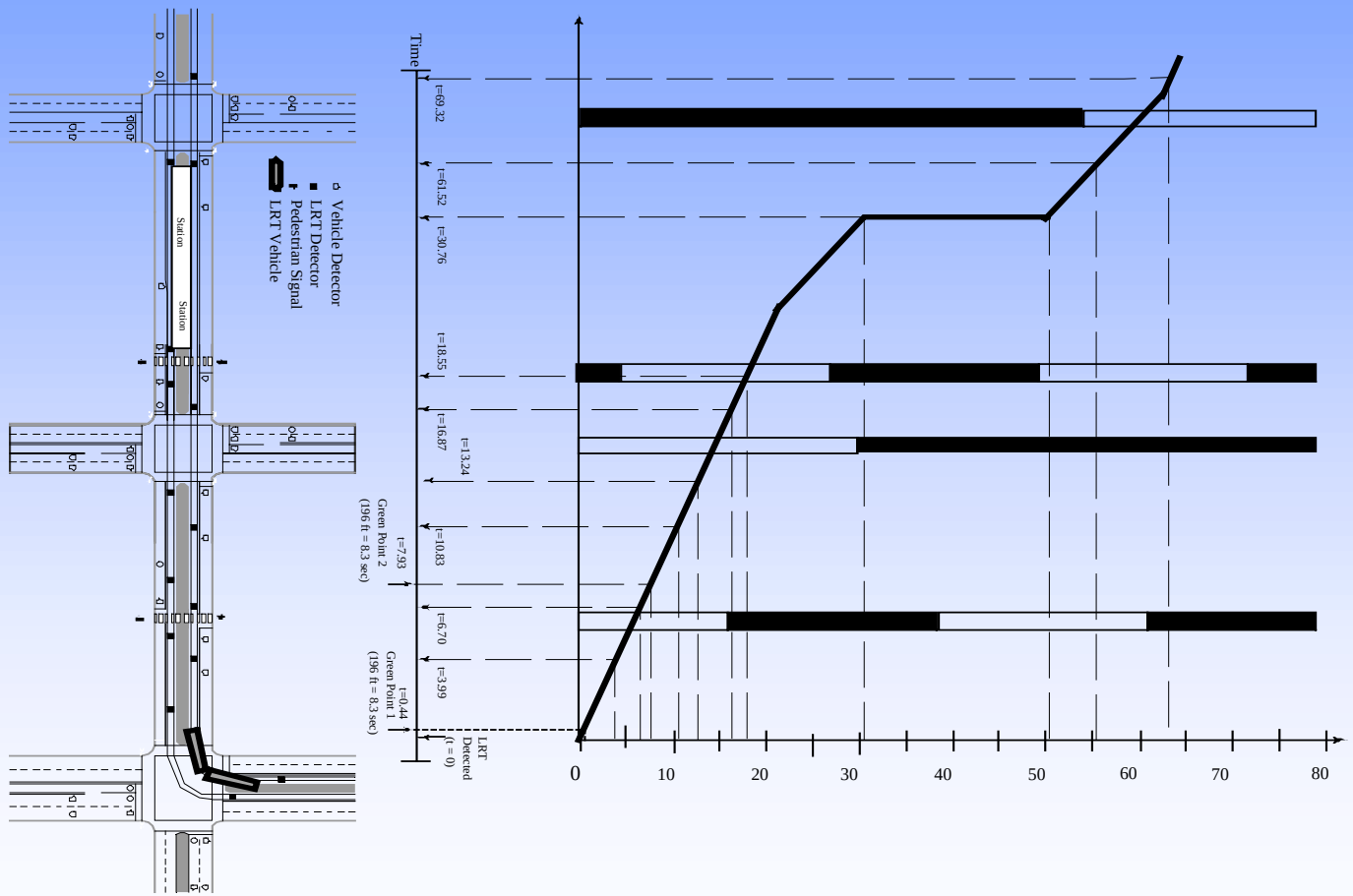
LRT ATMS Design Challenge

25mph LRT vehicle

Signalized Ped Crosssings



Integrating with Signal Control



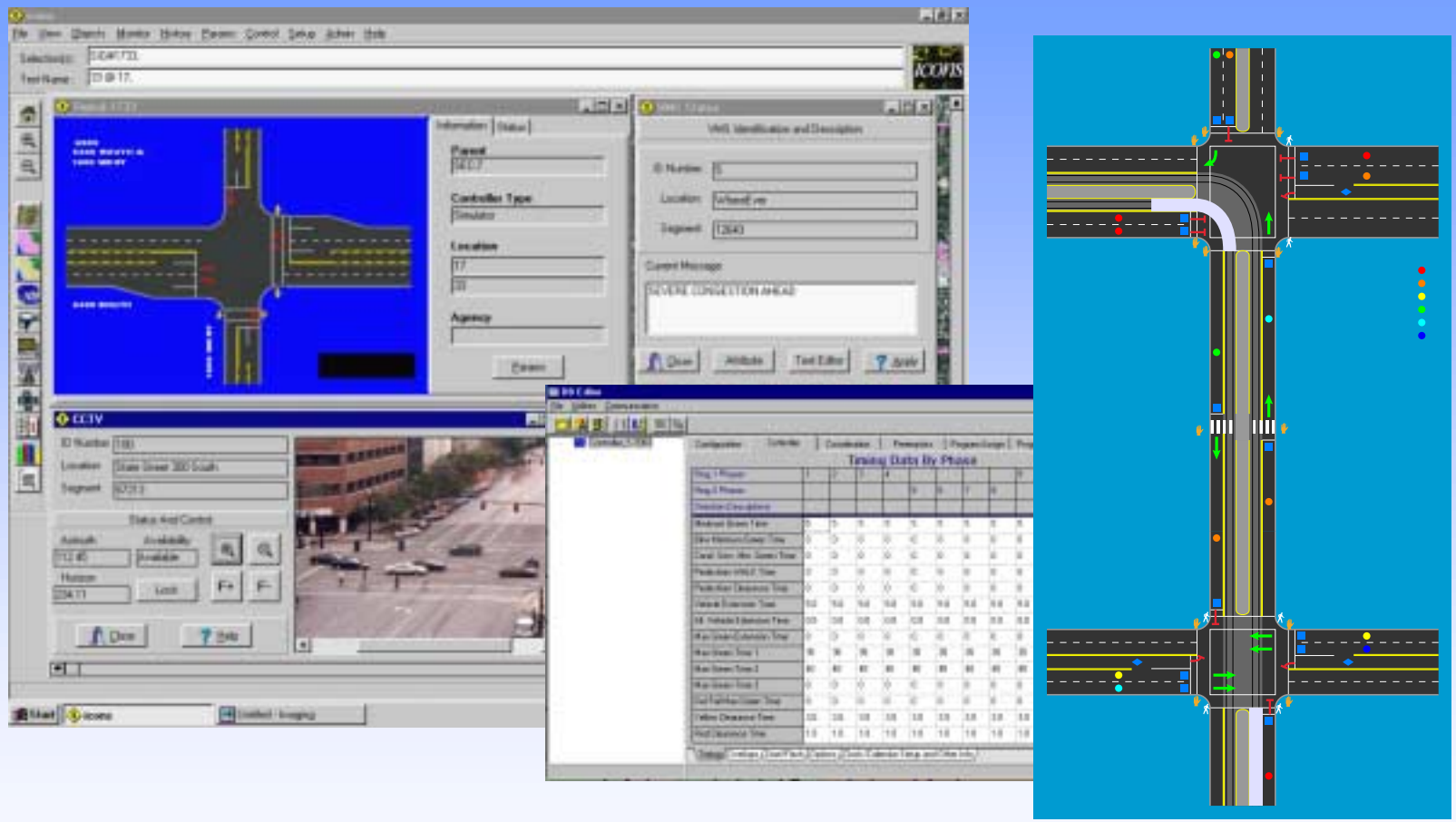
LRT ATMS Design Issues

- **Need prediction to prepare signal before train arrives at “Green Point”**
- **Need controller logic that can provide LRT service within coordinated signal timing**
- **Integrate into UDOT/SLC ATMS**

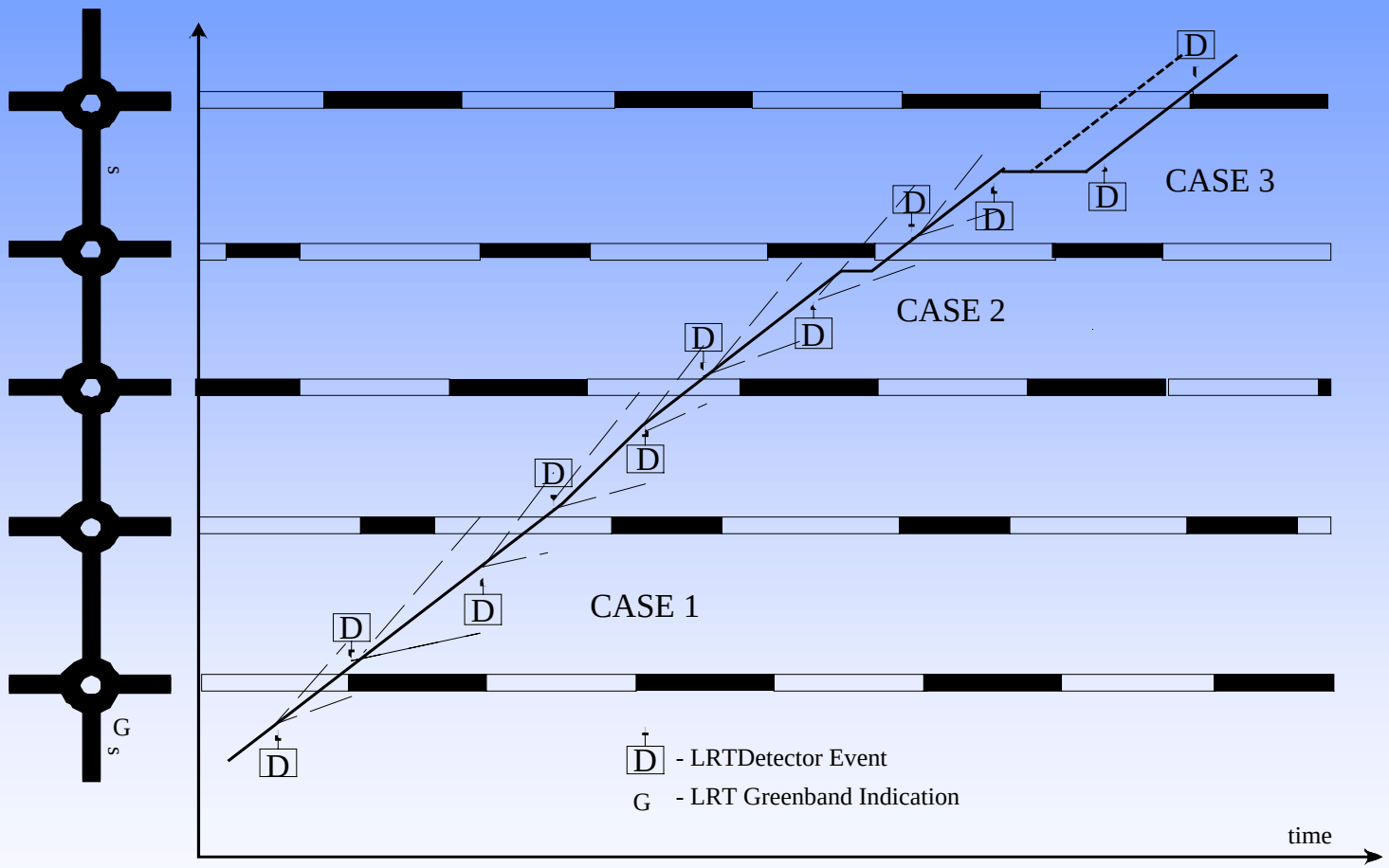
LRT ATMS Design Approach

- **Central ATMS Enhancements**
  - Operator Decision Support
    - Operations Monitoring
    - Controller Programming
  - LRT Priority Service
    - Prediction of LRV Position
    - Detector Fault Monitoring
- **Intersection Controller Enhancements**
  - Priority Timing
    - Progression
    - Coordination
    - Queue Jump
  - Existing TS-2 Cabinets
  - New 2070 ATC Controllers

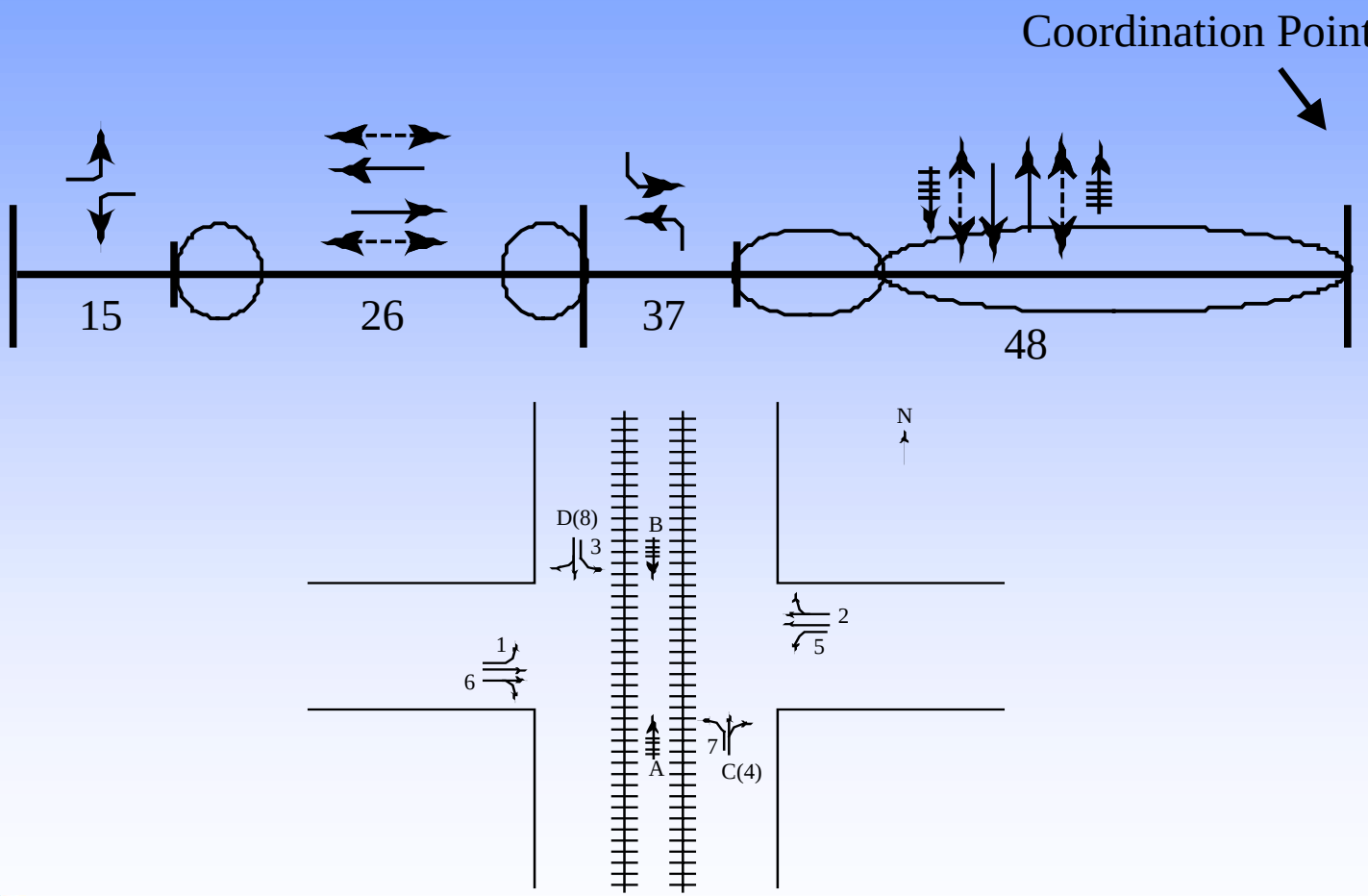
ATMS Workstation



LRT Path Prediction (LRT Priority Service)



Signal Timing -
LRT Service Opportunities



LRT Results

- **Developed an integrated system to provide traffic signal priority for LRT operations in downtown Salt Lake City**
- **Priority provided within coordinated signal operations**
- **LRT operations began revenue service on December 6, 1999**

SESSION 2.5

NextPhase

Intersection Management Software

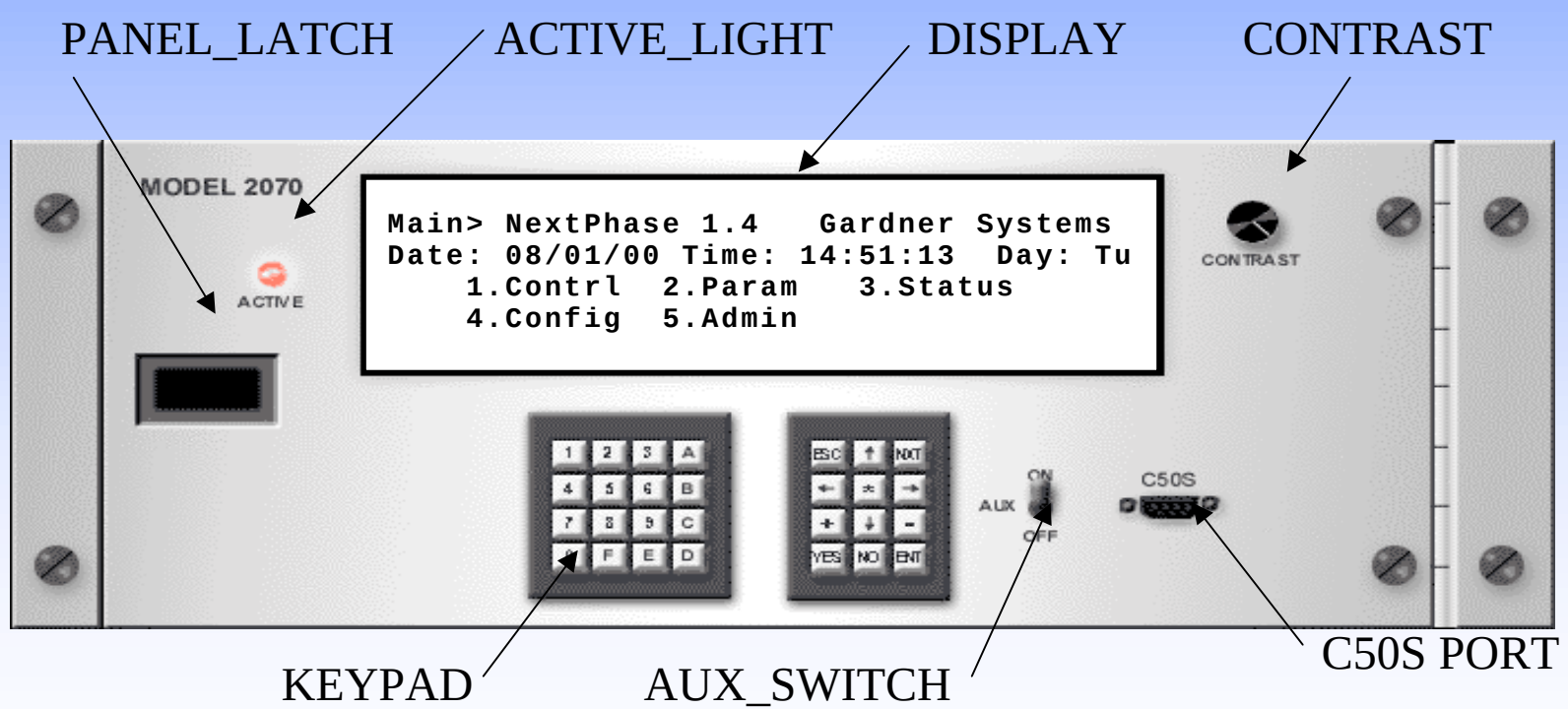
Craig Gardner

2070 Hardware Features

- **Model 2070 Hardware**
  - 32-Bit Processor with Real-Time Operating System
  - 4 or 8-Line by 40 Character Display Grid
  - Up to 4 External Communications Ports Available
  - Supports Multiple Cabinets -> 170, TS1, TS2, ITS
  - Modular Design Allows Different Configurations
    - Chassis, Power Supply, VME Expansion Cage, CPU Board, Front Panel, Field I/O & Communications Modules

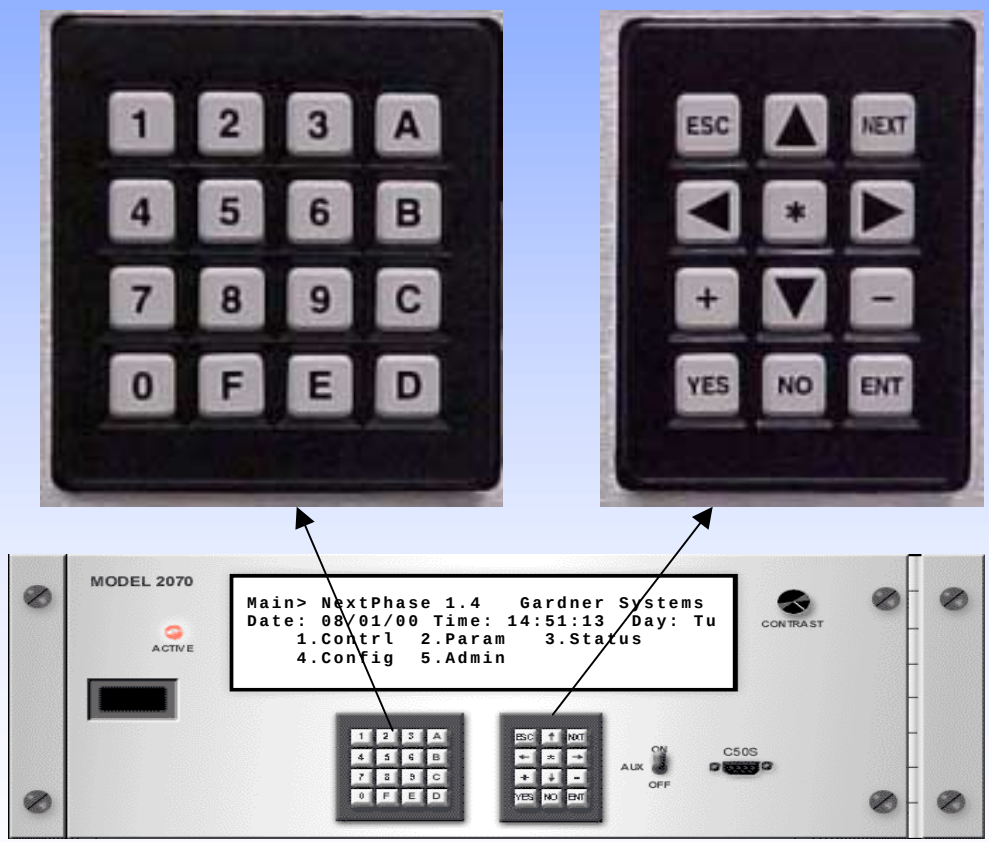
2070 Controls

- **The Model 2070 Controller Front Panel**



2070 Controls

The Model 2070 Controller Keypads



NextPhase Overview

- **Designed for ATC's such as the Model 2070**
- **C++ Reliability and Expansion (Source Avail.)**
- **Easy to use, Menu-Driven Interface**
- **Advanced Communications (NTCIP)**
- **Cooperate Multitasking (standard API)**
- **Extendable Features such as Adaptive Control or Transit Priority**

Capabilities of *NextPhase*

- **Standard Software Capabilities**
  - 40 Phases / 20 Overlaps
  - 20 Rings / 26 Barriers
    - Rings can Operate Independently or in Groups
  - Overlaps Configurable like Phases
    - Minimum Green
    - Actuated / Extension
    - Pedestrian Timings
  - 64 Vehicle / Pedestrian Detectors
  - Smart Menu System (shows configured only)
  - Standard Configuration Templates

Capabilities of *NextPhase*

- **Optional Software**
  - Traffic Adaptive Control (RHODES)
  - NTCIP Communications (ASC Objects)
  - CMS Control (NTCIP Translator)
  - CCTV (NTCIP Translator)
  - Ramp Metering
  - Reversible Lane & Gate Control

Capabilities of *NextPhase*

- **System Coordination**
  - **250 Coordination Plans Supported**
    - Coordinated, Adaptive, Free, Programmed Flash
    - Multiple Offset Values & Reference Points Available
  - **Multiple Transitioning Modes**
    - Hold, Dwell, Long Way, Short Way, Best Way
    - Minimum & Maximum Split Timings per Plan
  - **Internal and/or External Coordination Control**
    - Various Plan Selection Modes Available
    - Manual, TOD Schedules, or Remote Commands

Capabilities of *NextPhase*

- **User Interface**
  - Menu Driven Displays
  - Config. Based Data Filtering
  - Login and Passwords (Optional)
    - Multiple Access Levels
    - Automatic Logout Configurable
  - Configurable Preferences
    - Backlight
    - Key Repeat & Scrolling
  - Shortcut Keys for Bitfield Data (Flags)

Capabilities of *NextPhase*

- **Support of Multiple Cabinet Types**
  - Model 170
  - NEMA Controllers
    - NEMA TS1
    - NEMA TS2 - Type 1
  - Fully Configurable
  - 128 Input Channels
  - 128 Output Channels

Capabilities of *NextPhase*

- **External Communications**
  - Multiple Ports Configurable
  - Extended AB-3418 Protocol Support
  - NTCIP Comm. (Optional)
  - Wireless – Event Driven
  - Remote PC-Based Graphical Database Editor (Upload / Download Capabilities)
  - “NextWeb” Palm Device Interface

Capabilities of *NextPhase*

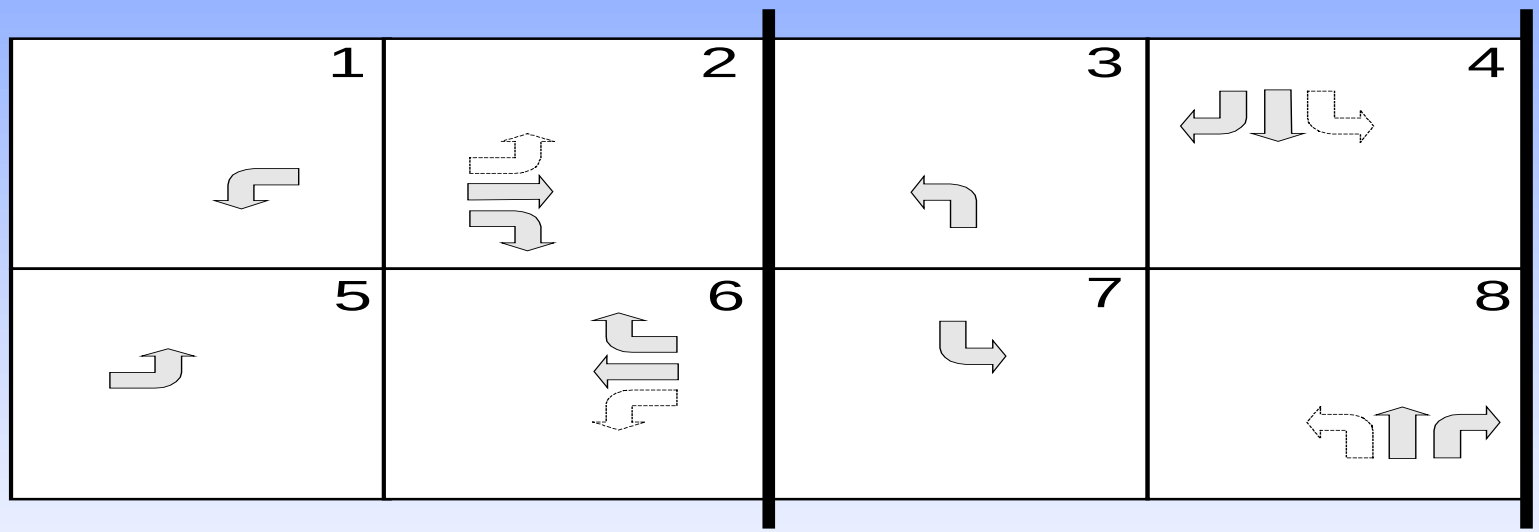
- ***NextPhase* Database**
  - Multiple Tables
    - 250 Plan-Related Data Tables
    - 10 Instances Supported for most Configuration Tables
  - Fail-Safe Checks and Back-ups
    - Automatic File Integrity Checks
    - Parameter Tables can be Backed-up or Restored
    - Corrupted Tables Automatically Restored from Backup
    - Changeable Range Limits (Yellow Clearance, Etc)

The Menu Structure

- **The Main Menu**
  - Submenu Options
    - Control [Control] -> Modify the Active Control Settings
    - Parameters [Param] -> Typical Day-to-Day Operations
    - Status [Status] -> Monitor Active Status Information
    - Configuration [Config] -> Initialization Information
    - Administration [Admin] -> Access and Interfacing

Ring Phase Configuration

- **Phase Rings Submenu (Dual-Ring Structure)**




```
PhsCfg 1> Ring Configuration
R1   1,2,a,3,4,b
R2   5,6,a,7,8,b
R3
```

“RHODES” Adaptive Control

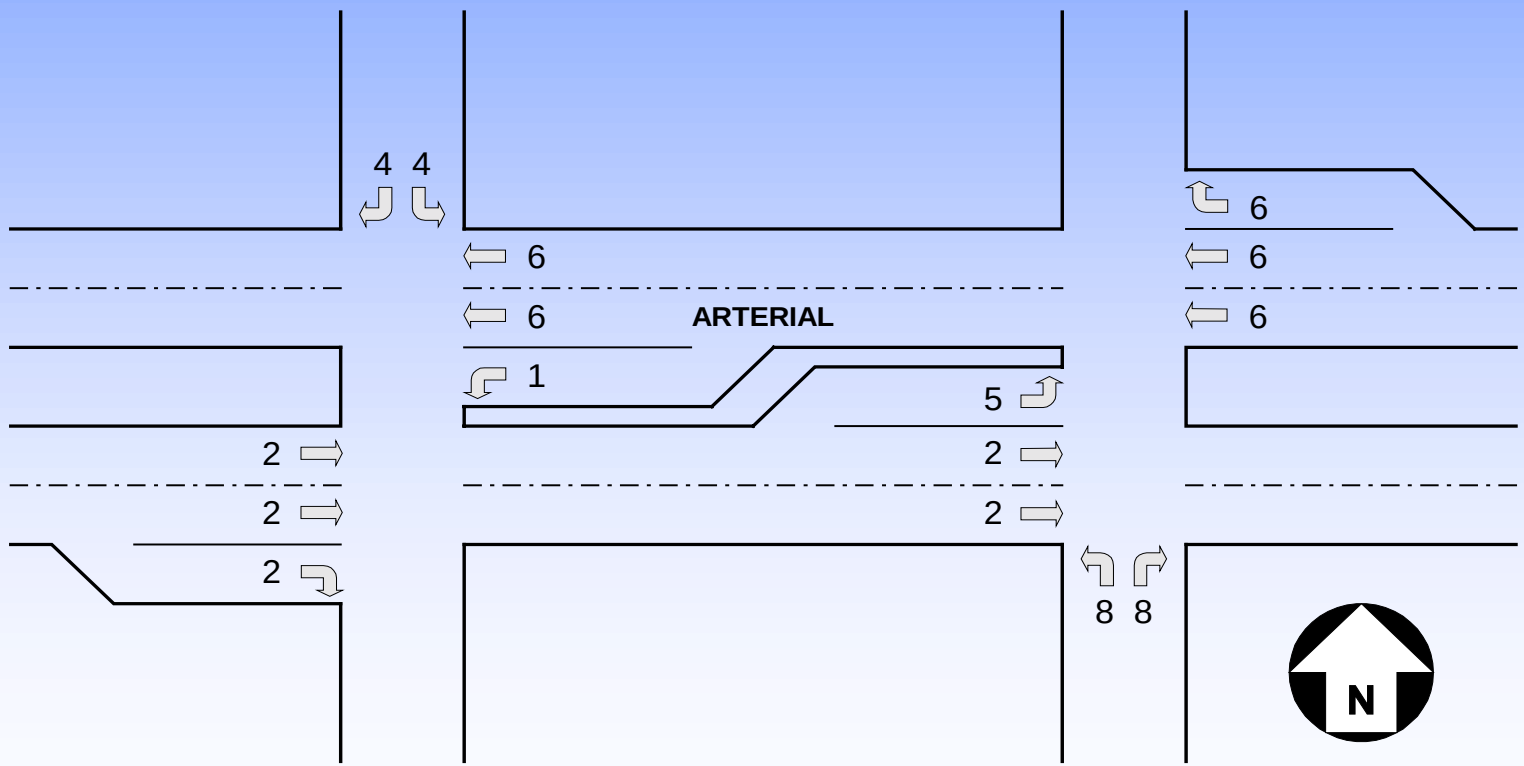
- **Adaptive Control Status**
  - Status Display
    - Plan [Plan] -> Indicates the Active *NextPhase* Plan
    - Mode [Mode] -> Shows the Requested Operating Mode
    - State [State] -> Shows Current Adaptive Operating Mode
    - Control Ready [OnLineRdy] -> Seconds Before On-Line
    - Peer Fail [PeerFail] -> Shows the Peer Message Status
      - Blank ( ) -> Not Configured
      - Dot (.) -> Peer Message Good
      - Bad (X) -> Peer Message Failure
    - Optional Feature Available in *NextPhase*

Adaptive Queue

- **Adaptive Queue Status**
  - Status Display Definitions
    - Screen Displays all the Queue Estimates used by the Optional Adaptive Control Module
    - Each Heading Represents a Specific Traffic Movement and the Associated Queue Length

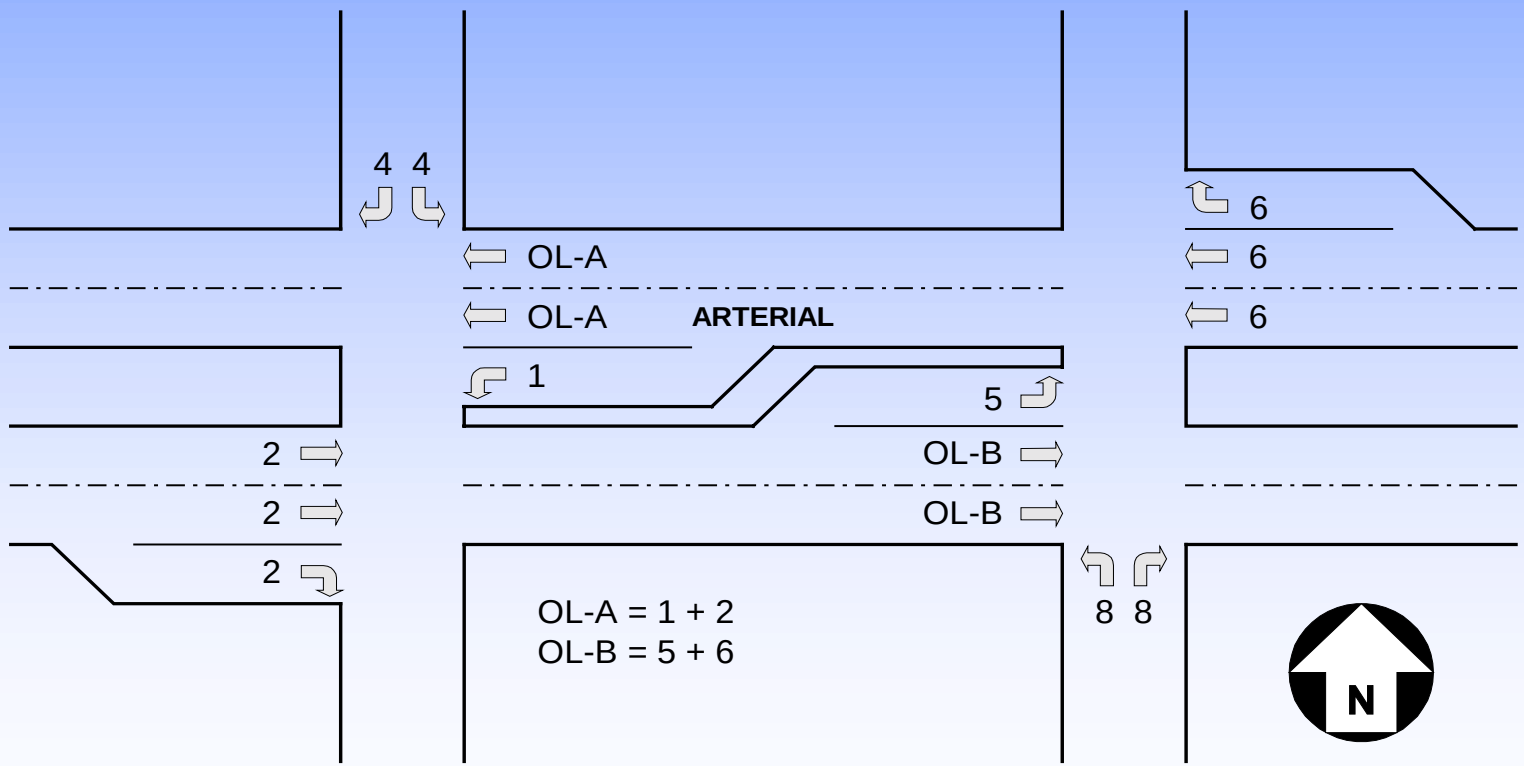
Examples / Diamonds

- **Diamond Interchange (Separate 3-Phase)**



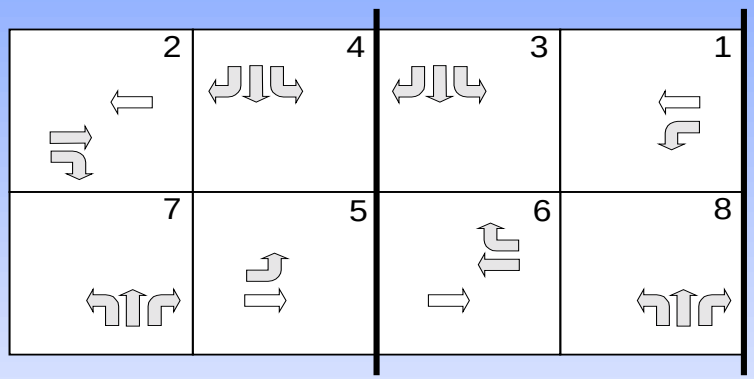
Examples / Diamonds

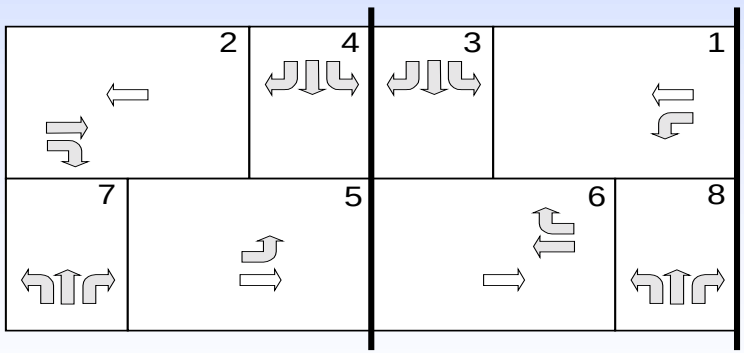
- **Diamond Interchange (Single 3-Phase)**

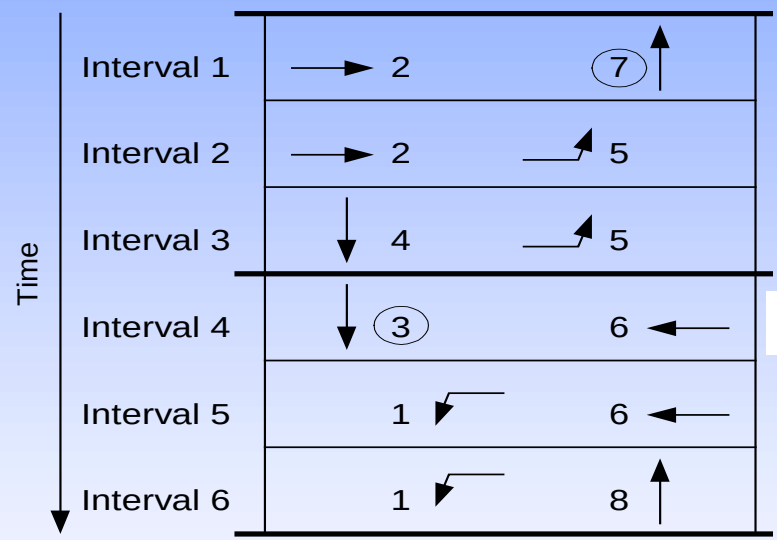


Examples / Diamonds (Rings)

- **Diamond Interchange (Single 4-Phase)**



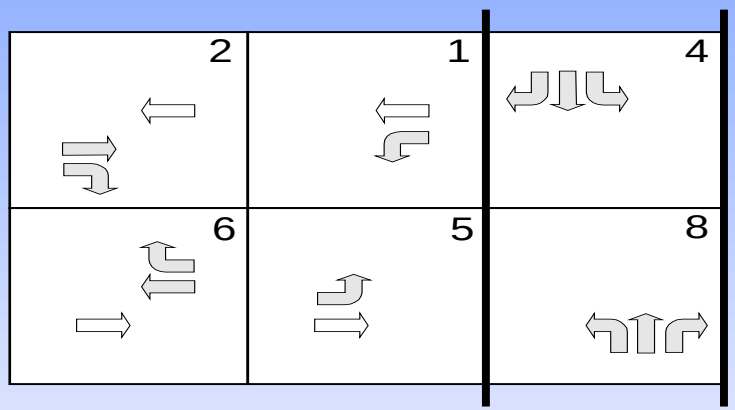


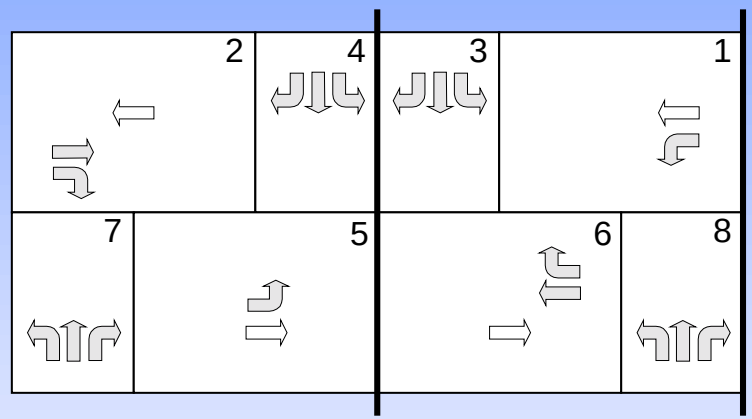


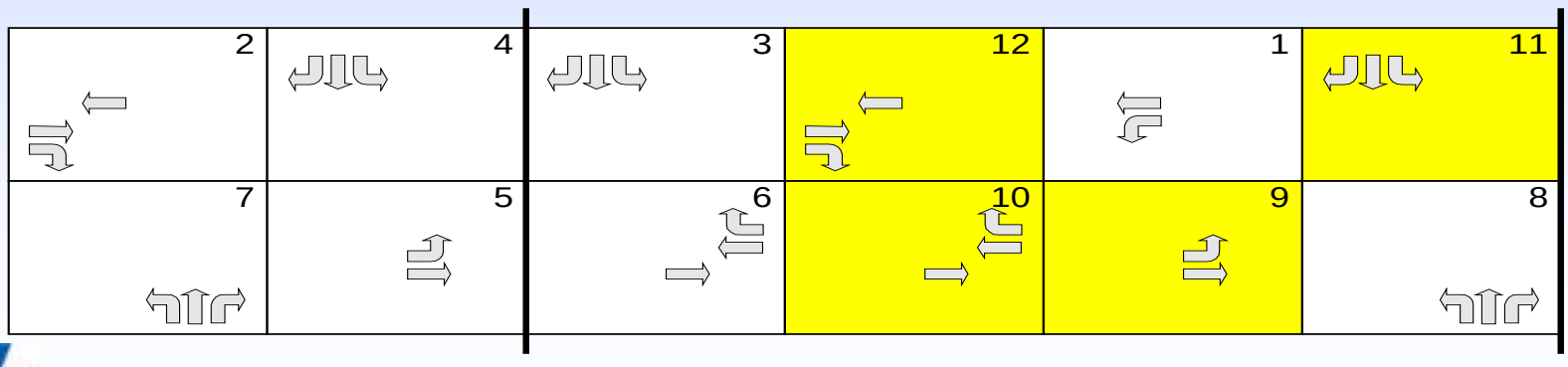

```
PhsCfg 1>  Ring Configuration
R1  2,4,a,3,1,b
R2  7,5,a,6,8,b
R3
```

Examples / Diamonds (Rings)

- **The Power of *NextPhase* (3 & 4-Phase)**

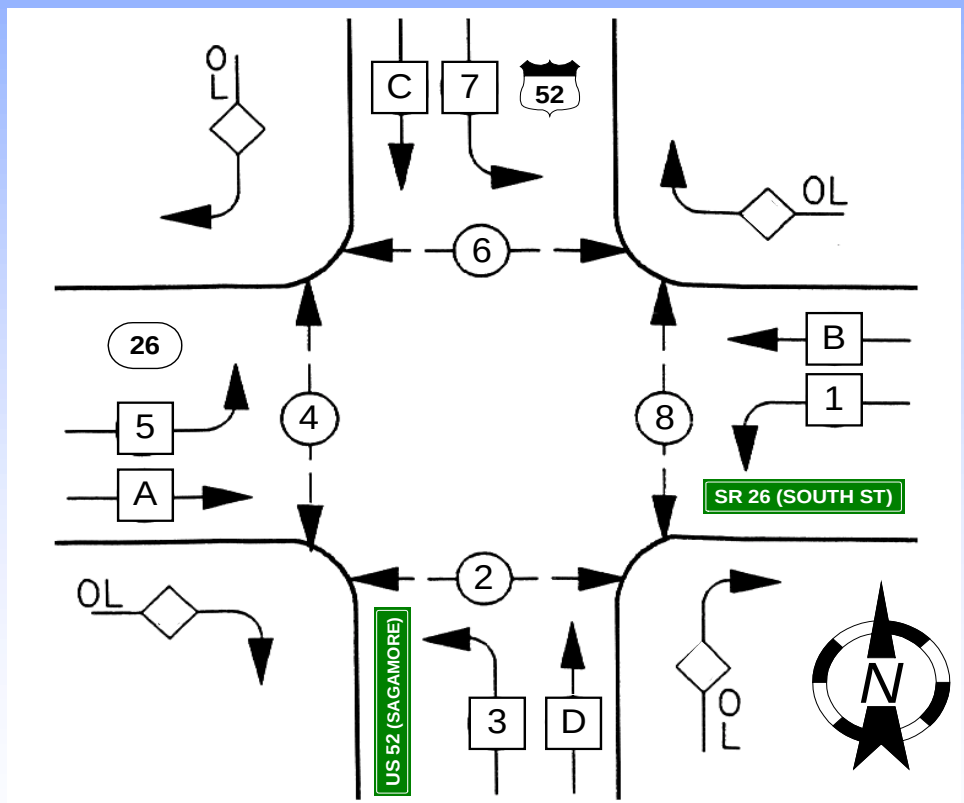


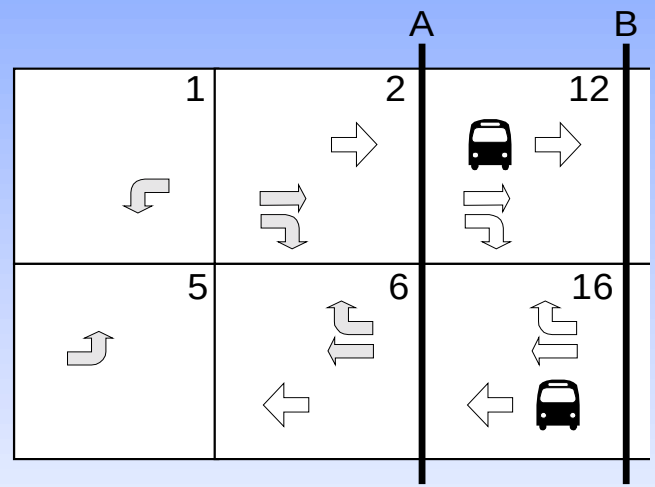




Examples / Bus Priority

- **Bus Priority Demonstration (With Priority)**

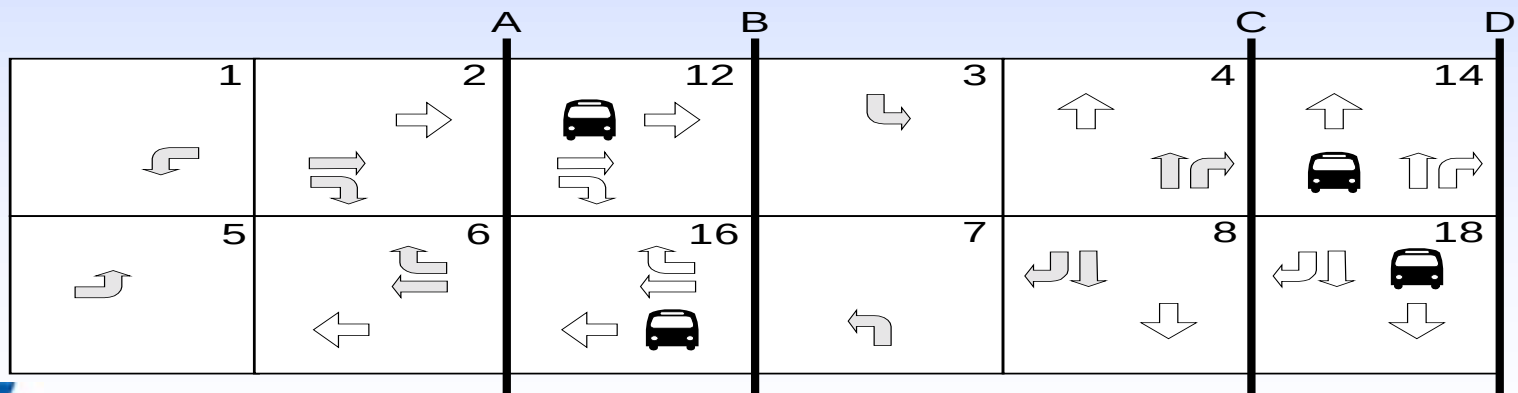





```
PhsCfg 1>  Ring Configuration
R1   1,2,a,12,b,3,4,c,14,d
R2   5,6,a,16,b,7,8,c,18,d
R3   22,26,32
```

Examples / Bus Priority

- **Control of Slack Time Allocation after Hold Phases – Maximum Green While Coordinated**
  - Typically used when Phases are Omitted Periodically
  - Both Bus and Transit Priority are Practical Examples
  - Particularly Helpful for Fixed-Time Operation (Max Recall)



Bus & LRT Transit Priority

- Any number of transit movements
- Early green, extended green, inserted green
- Multiple opportunities in cycle when needed
- Any number of advance detectors
- Delay any action after detection
- Queue jump phases if needed
- No offset transitions – stays in step
- Lock out period after priority if desired
- Free, coordinated, phase sequence by TOD
- LRT reverse running if needed
- Activate “Trolley Coming” signs

Overview of Overlaps

- ***NextPhase* Overlap Functionality**
  - Overlaps Operative Similar to Phases
    - Contains Minimum and Maximum Green Times
    - Has its own Red, Yellow, and Green Clearance Times
    - Compatible Pedestrian Timing with Some Overlap Types
  - Other Advanced Overlap Features
    - Ability to Terminate Overlaps (with Input) just as Phases
    - An Optional Reservice Timer that Control Reservice Time
    - Option of using Phase Clearances or Overlap Clearances

NextPhase Summary

- Smart User Interface
- 40 phases
- 20 rings
- 26 barriers
- 20 overlaps
- 10 preempts
- Mapped I/O
- 250 plans

- Simple Setup w/ Templates
- Ped overlaps
- Multiple signals
- “Free” coordination
- Repeated phases
- Unequal double cycling
- Transit Priority
- Complex Intersections

SESSION 2.5

2070 and RELATED SOFTWARE PRODUCTS
NAZTEC, INC.

- **INTERSECTION SIGNAL CONTROL**
- **STREETWISE ATMS**
- **PALM PILOT™ INTERFACE**
- **2070 TEST BOX and SIMTRAFFIC™**
  - SUITCASE TESTER
  - HARDWARE-IN-THE-LOOP SIMULATION

CLYDE NEEL

2070/NTCIP CONTROLLER FEATURES

- 16 PHASES / 16 OVERLAPS / 4 RINGS
- NTCIP OVER ETHERNET AND SERIAL
- DYNAMIC (VARIABLE) MAX TIMES
- TWICE-PER-CYCLE LEFT TURNS
- OVERLAP DISABLE BY PLAN
- SUPPRESS OVERLAPS BY PHASE OR OVERLAP
- VOLUME AND OCCUPANCY-ON-GREEN MOE's
- NTCIP & ENHANCED COORDINATION MODES (FIXED/FLOATING FORCE OFFS)
- CIC ADAPTIVE SPLIT ALGORITHM PROVIDES ENHANCED TRAFFIC RESPONSIVE, OR ADAPTIVE LEVEL CONTROL
- RECOVER COORDINATION WHEN PED CALLS OVERRUN THE SPLIT FORCE OFF
- COME OUT OF PREEMPTION IN COORDINATION
- 10 DEFINABLE PREEMPTION CHANNELS

STREETWISE ATMS: MOST POPULAR TOOLS

- PALM PILOT™ UPLOAD/DOWNLOAD TO CONTROLLER
- PAGER AND E-MAIL NOTIFICATION OF SELECTED ALARMS
- REAL-TIME SPLIT MONITORING & TIME-SPACE DIAGRAMS
- Synchro™ AND SimTraffic™ TIME-SAVING INTERFACE
- INCIDENT MANAGER & TRAVEL ADVISORIES
- INTERNET/WWV/GPS TIME REFERENCE INTERFACE
- THIRD PARTY API FOR LOCAL AGENCY APPLICATIONS
- CMS AND CAMERA CONTROL
- MULTIPLE DETECTOR MINING GRAPHS & REPORTS

Palm Pilot™ INTERFACE

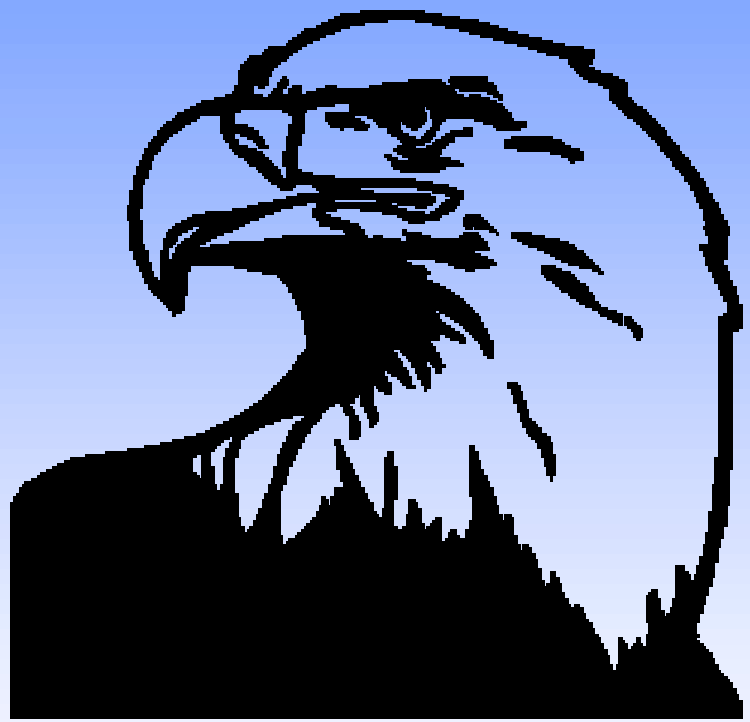
- UPLOAD/DOWNLOAD DATABASE TO FIELD CONTROLLERS
- SYNCHRONIZE REAL-TIME CLOCKS
- HotSync™ WITH StreetWise TO MAINTAIN LATEST DATABASE
- LESS TIME AND RISK IN FIELD THAN USE OF NOTEBOOK COMPUTERS
- EASE OF USE FOR FIELD ENGINEERS

Naztec 2070/TS-2 and SimTraffic™ CI

- **INDIVIDUAL VEHICLE CALLS FROM SimTraffic™ EXERCISE THE DETECTOR INPUTS IN THE CONTROLLER, ALLOWING THE USER TO STUDY THE EFFECT OF TIMING PLAN STRATEGIES CLOSER TO REAL-WORLD CONDITIONS.**

SESSION 2.5

EAGLE TRAFFIC CONTROL SYSTEMS



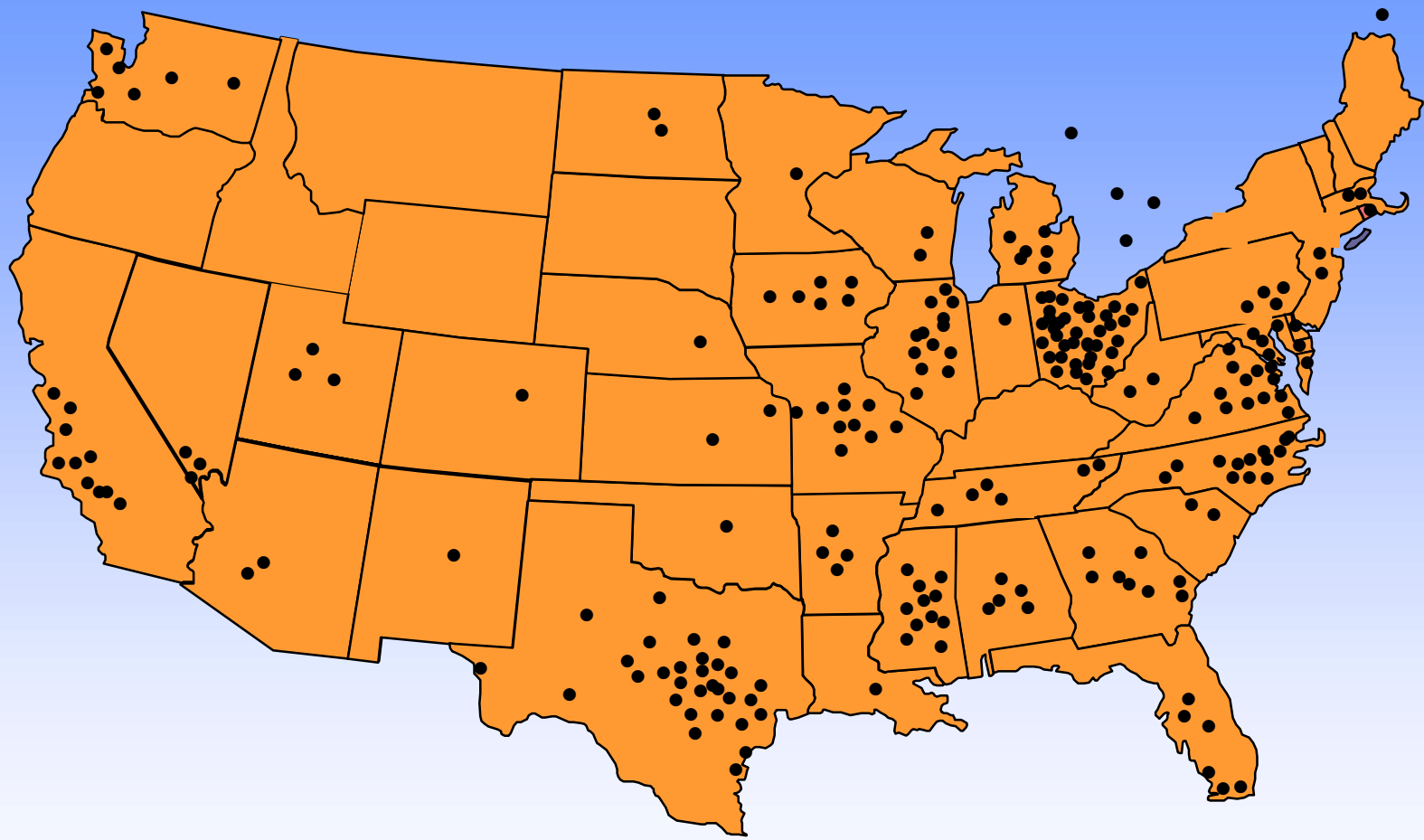
DAVE MILLER

PRODUCT LINES

FROM SIGNALS TO SYSTEMS...

...THE SINGLE SOURCE SUPPLIER OF TRANSPORTATION AND PARKING PRODUCTS

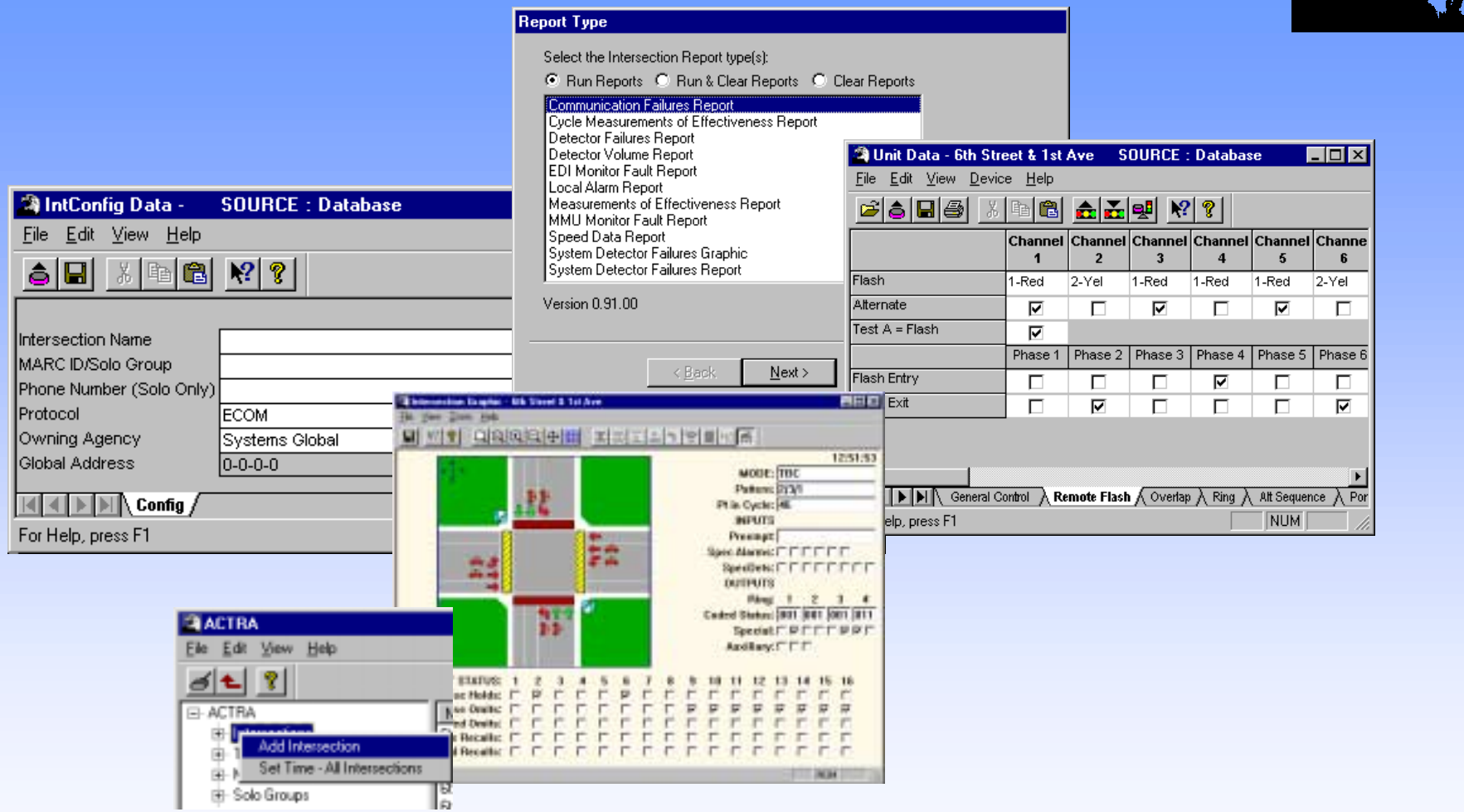
SYSTEMS INSTALLED



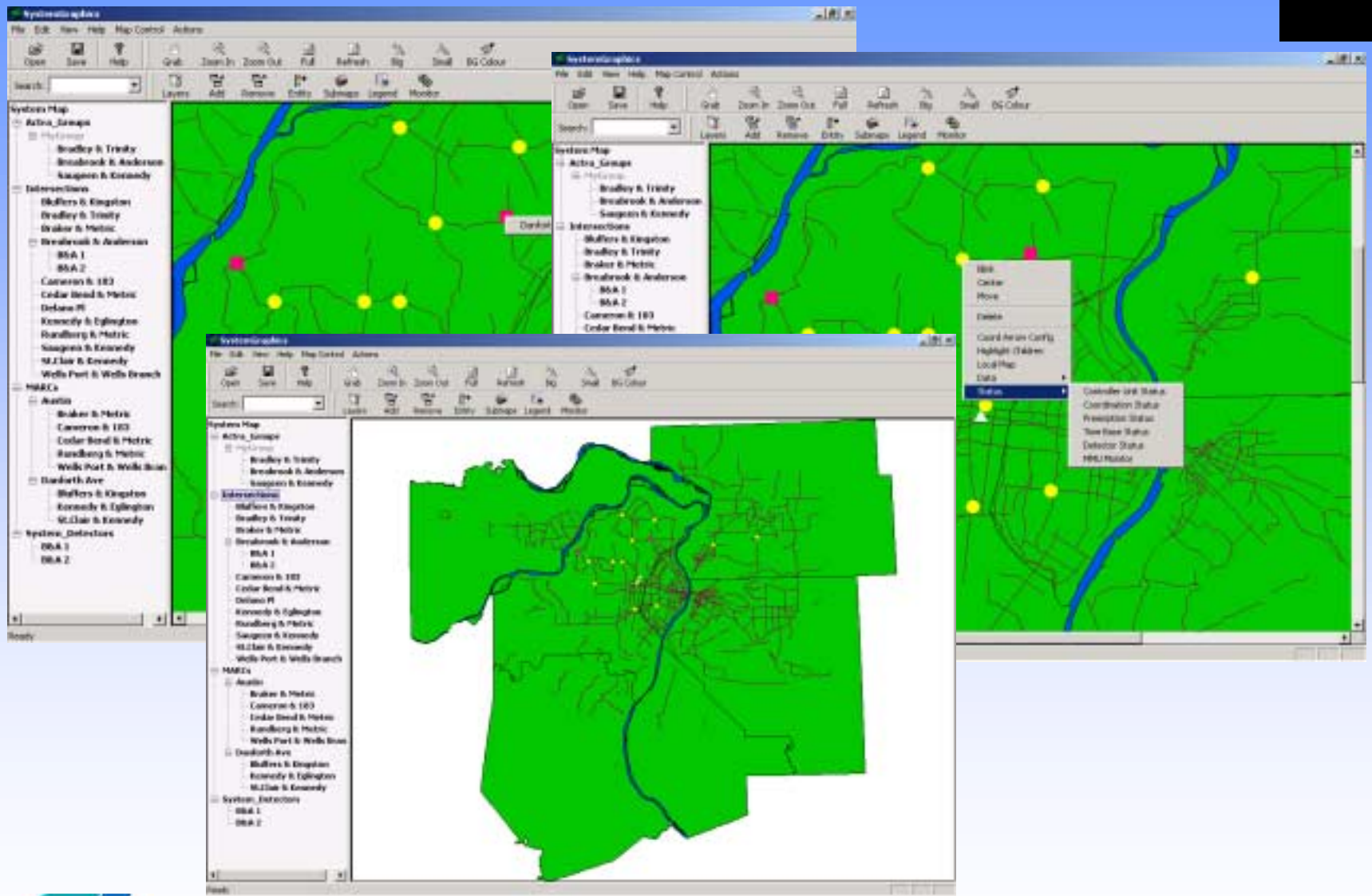
ACTRA SYSTEM FEATURES

- A 3RD GENERATION INTELLIGENT TRANSPORTATION MANAGEMENT SYSTEM
- OFFERS THE END-USER CHOICES IN TRAFFIC CONTROL
- RUNS IN A FAMILIAR WINDOWS ENVIRONMENT
- INTEGRATES WITH SOFTWARE DEVELOPED BY OTHER SIEMENS COMPANIES
- PROVIDES OPEN ARCHITECTURE
- USES INDUSTRY STANDARD INTERFACES AND COMPONENTS
- OPEN CLIENT/SERVER ARCHITECTURE
  - FULLY SCALABLE
  - VIRTUALLY UNLIMITED EXPANDABILITY
- A TRUE ATMS/ITMS

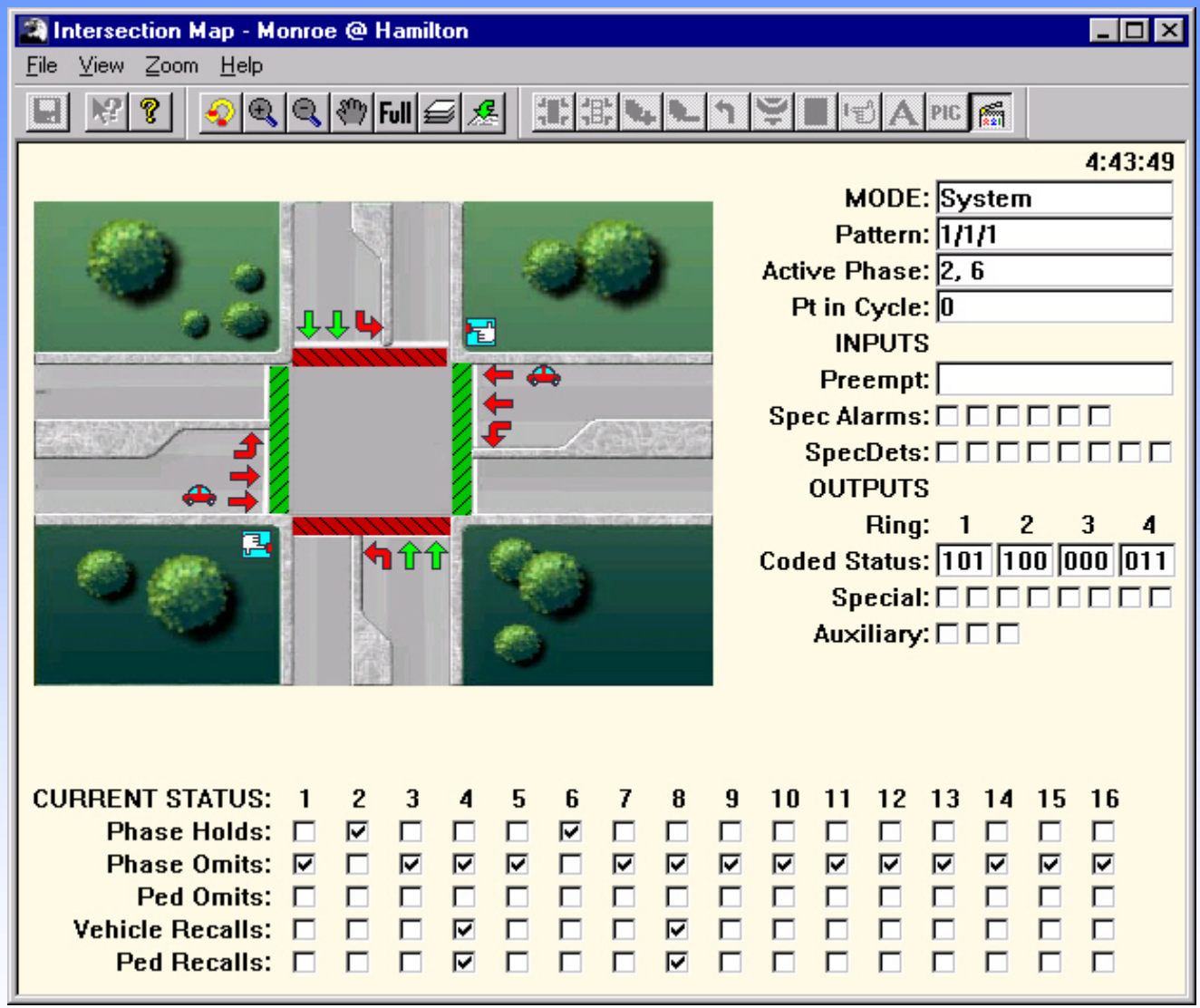
USER INTERFACE



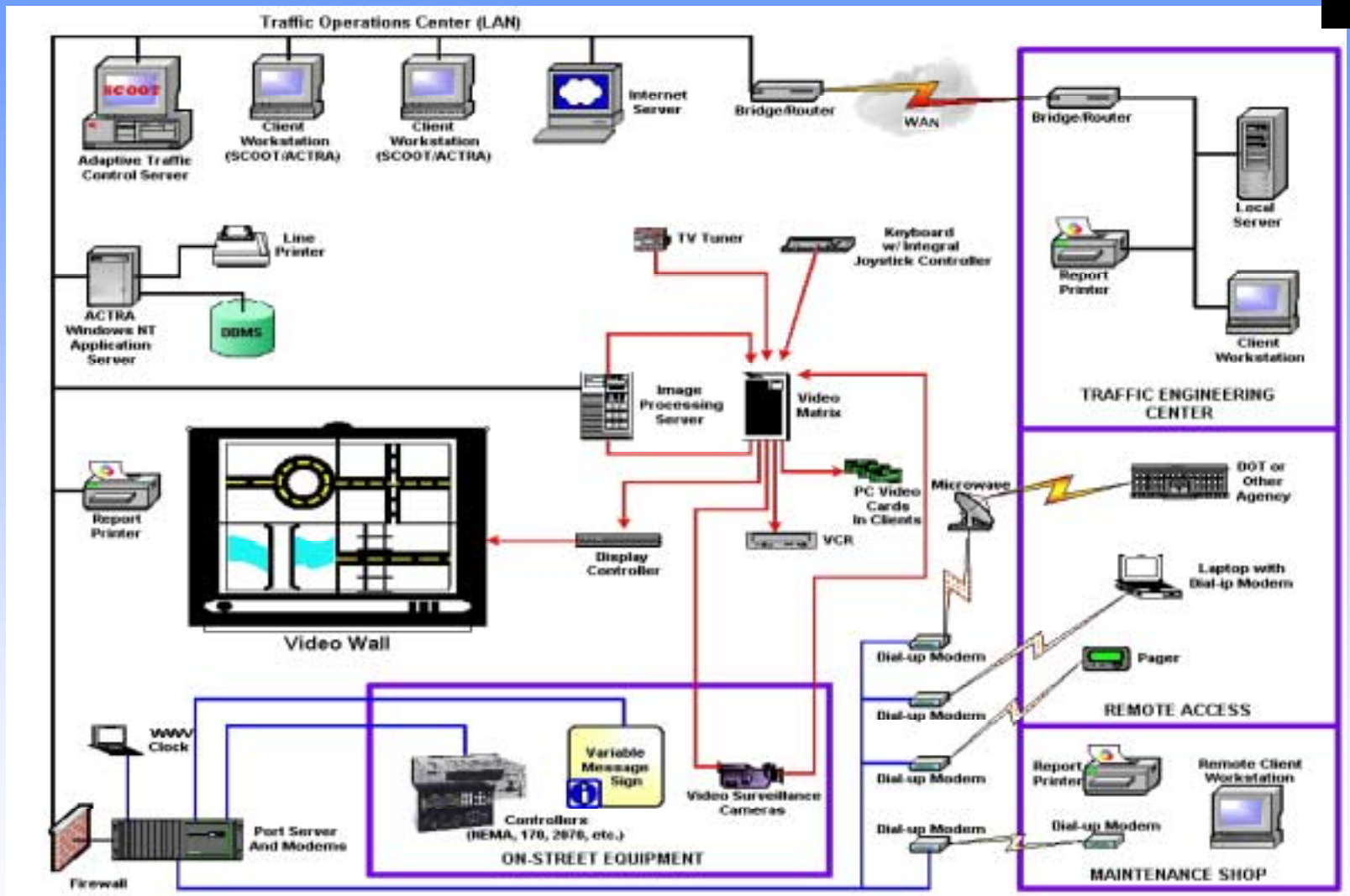
AREA MAPS



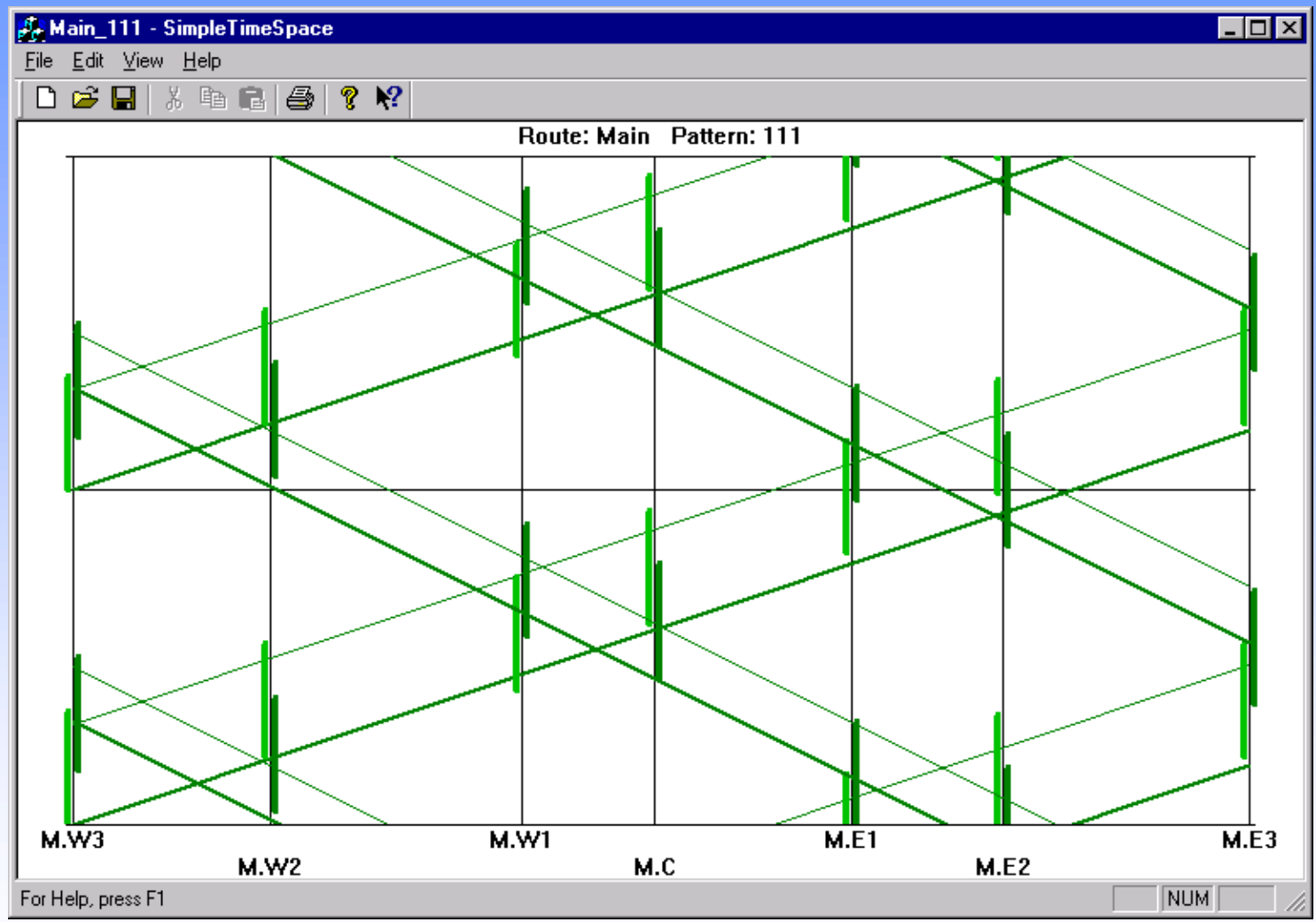
ACTRA INTERSECTION



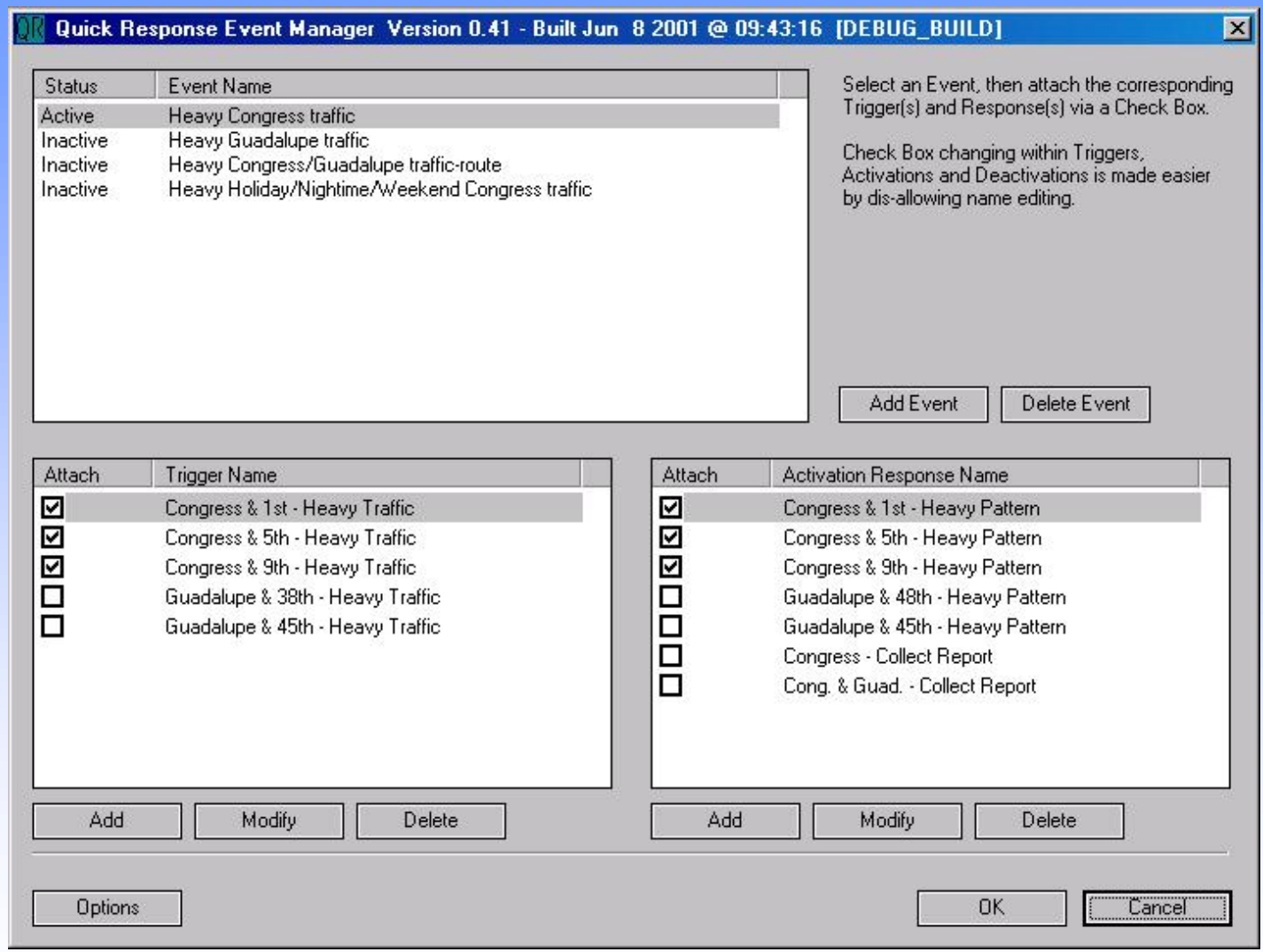
LARGE-SIZED ACTRA SYSTEM ARCHITECTURE



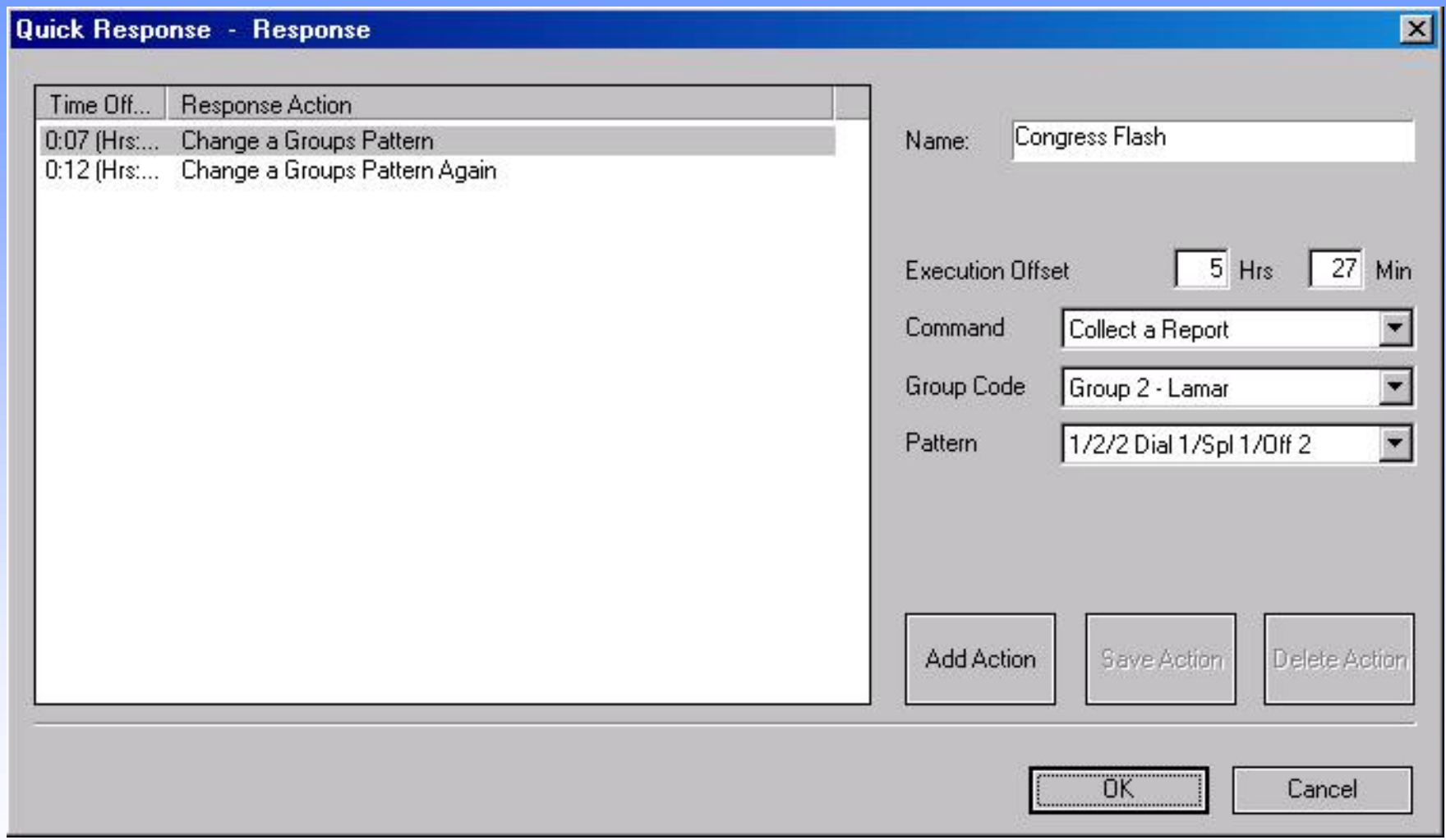
TIME SPACE DIAGRAM WITH ALL REAL INTERSECTIONS



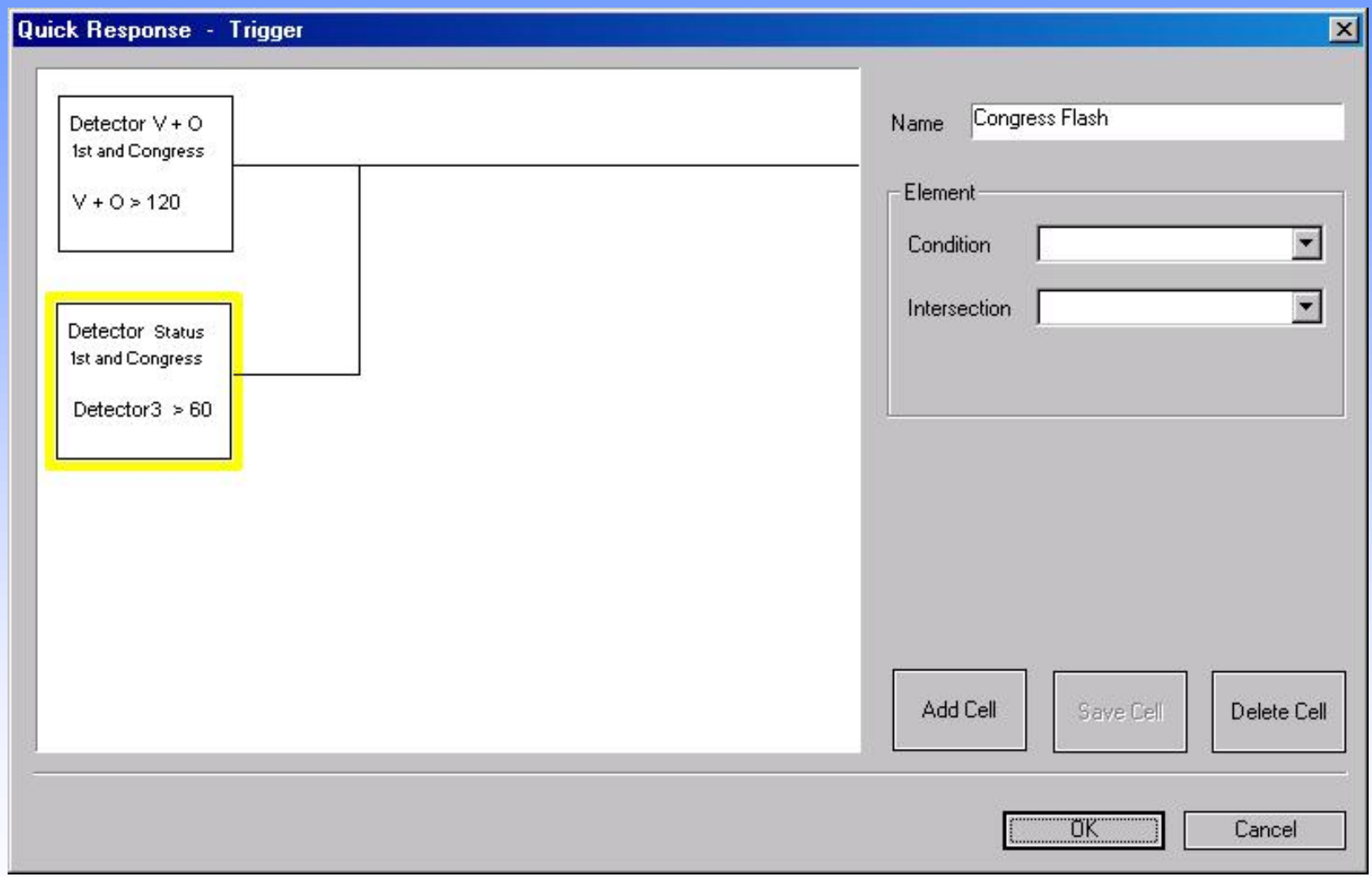
QUICK RESPONSE



QUICK RESPONSE



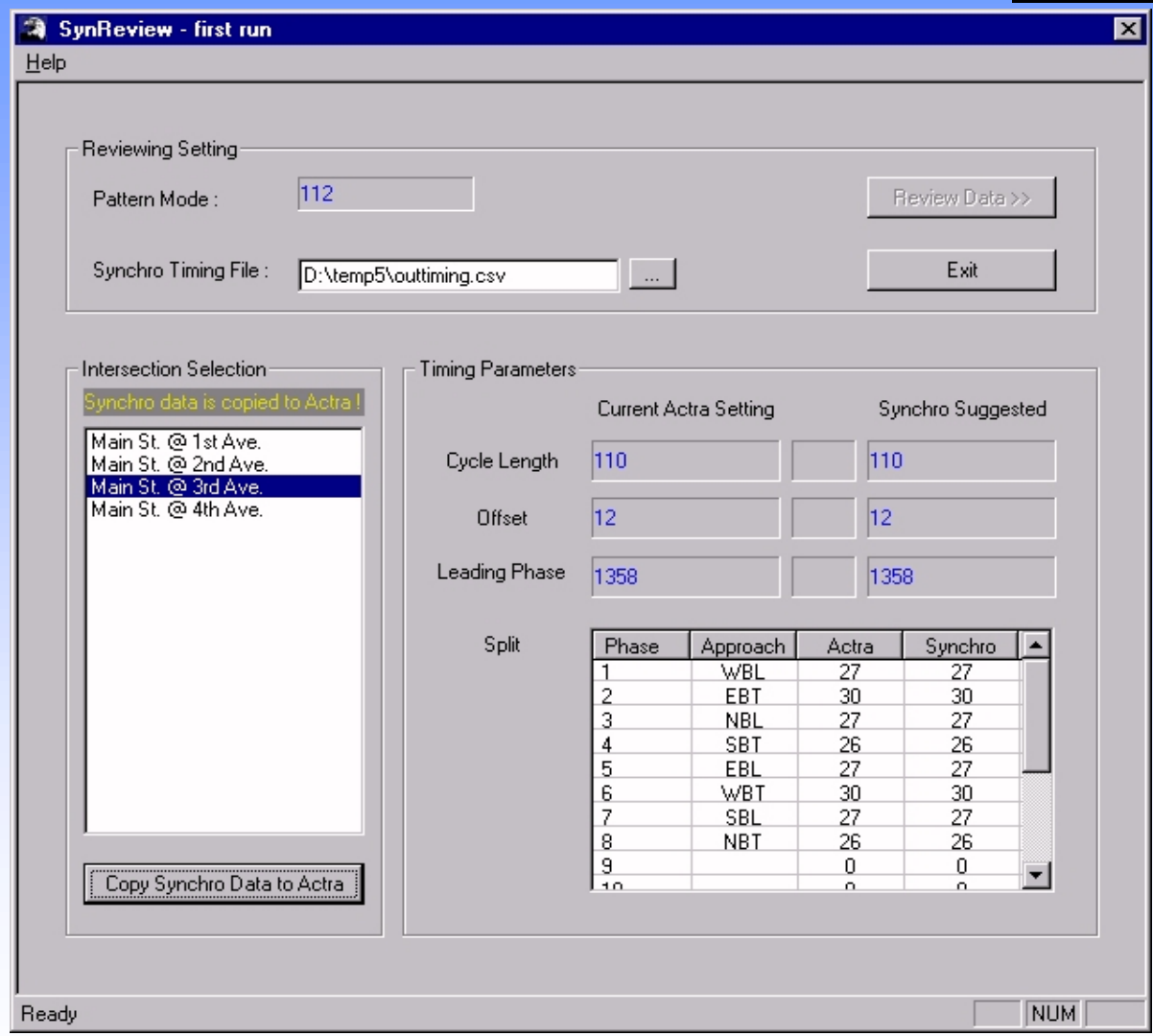
LOGIC DIAGRAMS



SYNCHRO

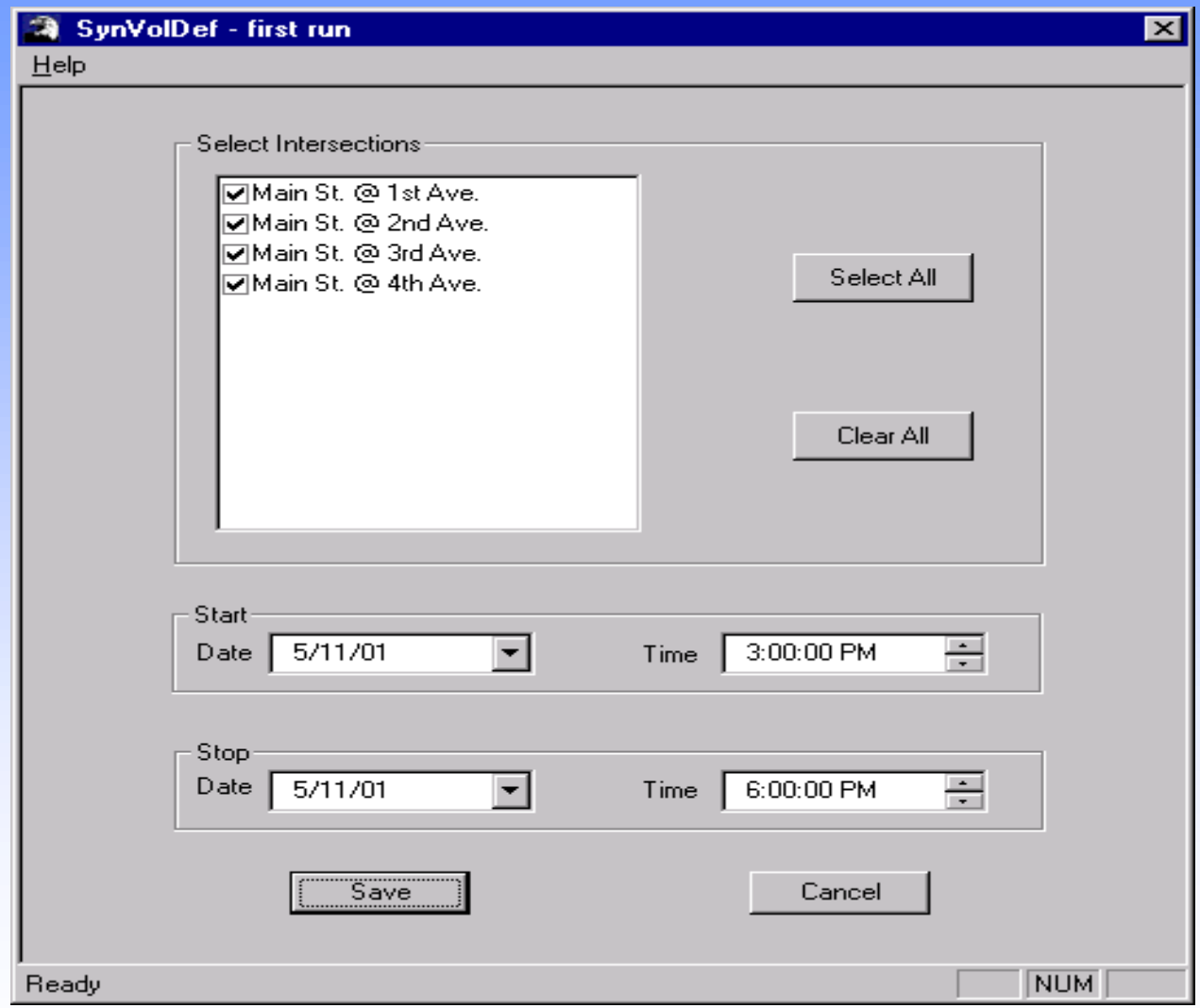
OUTPUT REVIEW

THE USER CAN COPY THE SYNCHRO OUTPUT VALUE TO ACTRA BY PRESSING THE COPY BUTTON

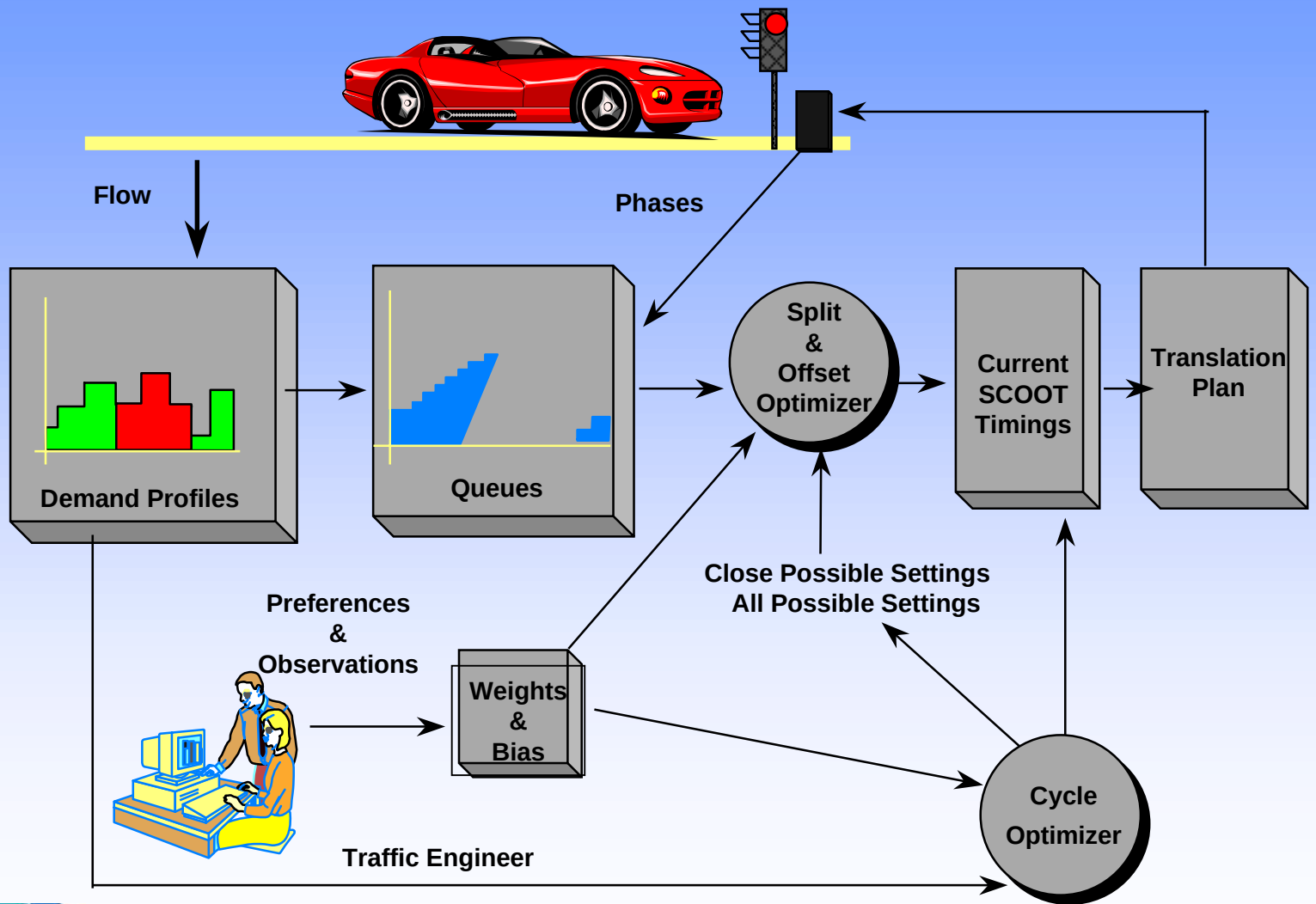


SYNCHRO

THE USER CAN SET UP THE TIME PERIOD FOR VOLUME DATA COLLECTION IN 15 MINUTES INTERVALS

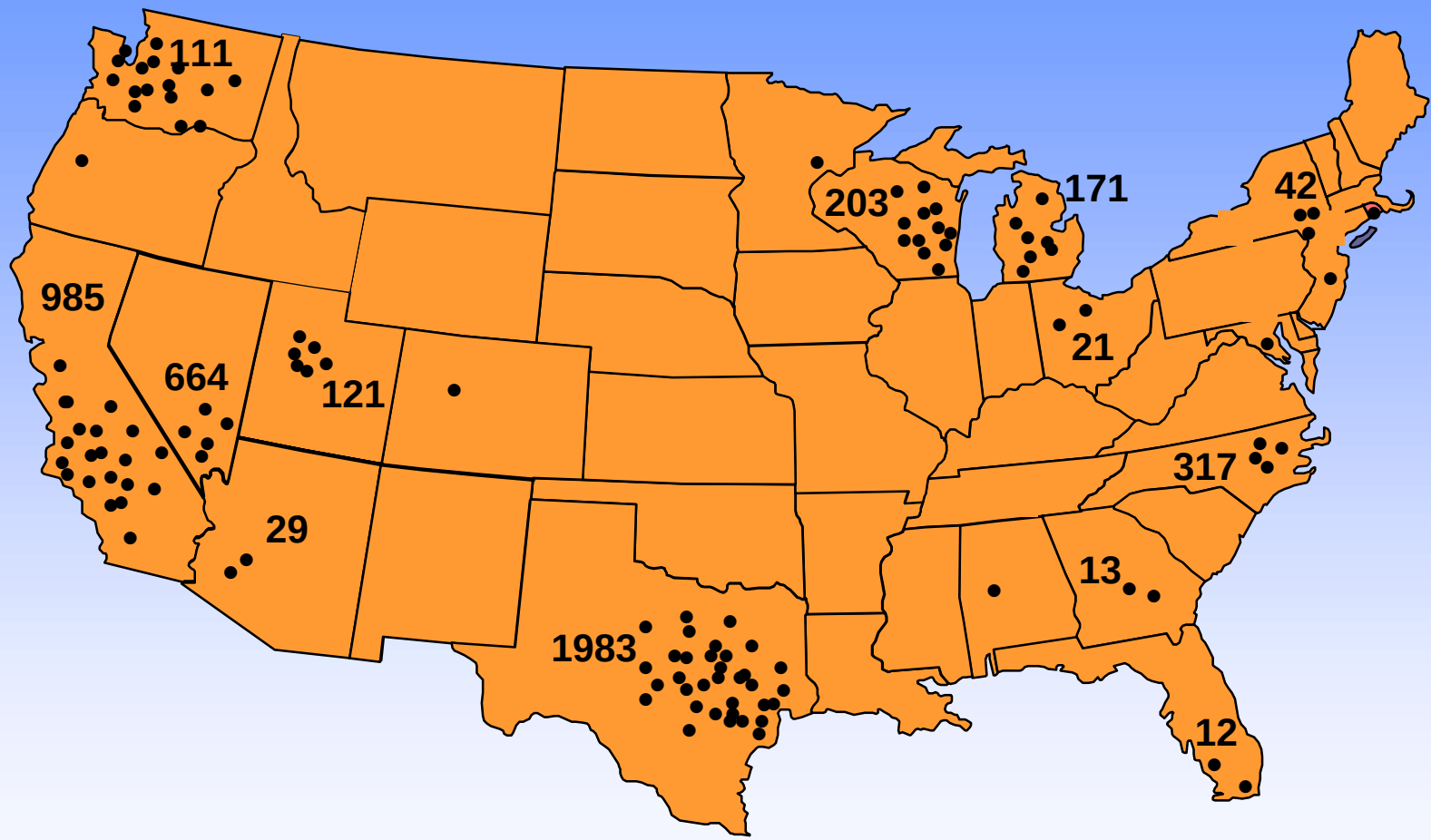


SCOOT GENERAL OVERVIEW



ITS CABINET

2070/ATC CONTROLLER UNITS INSTALLED



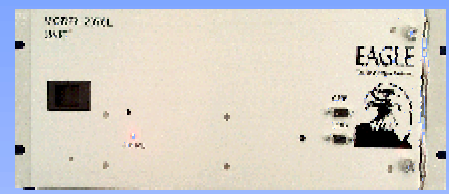
SE-PAC 2070/ATC SOFTWARE

INCORPORATES 15 YEARS OF ACTUAL "ON-STREET" TRAFFIC MONITORING AND CONTROLLING EXPERIENCE

- SIX COORDINATION MODES
- ADAPTIVE TRAFFIC CONTROL
- PREEMPTIVE/ PRIORITY ROUTINES
- NUMEROUS STANDARD REPORTS
- BUILT-IN DIAGNOSTICS
- TIME BASE CONTROL

VERSIONS OF THE 2070/ATC

2070/ATC
ADVANCED REPLACEMENT
FOR THE 170 & 170E



2070L
BLANK FRONT PANEL
VME OPTIONAL

2070N
NEMA TS1 COMPATIBLE

2070 ITS
NO FIELD I/O
USES SERIAL SDLC
CONNECTION TO SIU

ALL TEES HARDWARE DEVICES

		EAGLE PART
CONTROLLERS & SUBASSEMBLIES:		
2070	Unit Chassis	AAD14171P001
2070-1A	CPU Module, 2 board, VME, Data Key, OS/9™	AAD13981P001
2070-1B	CPU Module, 1 board, Serial Hub, Data Key, OS/9™, no VME	AAD13983P001
2070-2A	Field I/O for Type 170 cabinet wiring, no Data Key	AAD14081P003
2070-2B	Field I/O Interface for NEMA or ITS cabinet wiring	AAD14243P001
2070-2C	Field I/O for TS-2, Type 2	AAD14839P001
2070-3A	Front Panel Module, 4 lines of 40 characters, 2 keypads	AAD14172P001
2070-3B	Front Panel Module, 8 lines of 40 characters, 2 keypads	AAD14172P002
2070-3C	Front Panel Module, blank, C60 connector for computer	AAD14172P003
2070-4A	Power Supply Module, 10 amp, with +5 V Standby for VME rack	AAD11944P001
2070-4B	Power Supply Module, 3.5 amp, no +5 V Standby for VME rack	AAD11944P002
2070-5A	VME Cage Assembly, 5 slot, for 2070-1A, requires 2070-4A	AAD11938P001
2070-5B	MCB Mounting Assembly, 1 slot, for 2070-1A	AAD13939P001
2070-8	NEMA Interface Module, TS-1 or TS-2 Type 2 cabinet wiring	AAD12163P003
2070-9	2070N Back Cover for 2070-8A (optional, not required)	FFD12168P001
COMMUNICATIONS MODULES:		
2070-6A	Async/Modem Serial Comm Module, 1200 bps	AAD11942P002
2070-6B	Async/Modem Serial Comm Module, 9600 bps (short distance)	AAD11942P001
	External Modem, 1200-19200 bps, with cable for 2070-7	AAD14251P001
2070-6C	Dial-up modem ITU V.90, 2400 to 57000 bps (Future)	AAD13974P001
2070-6D	Internal Fiber Modem, 1300 nM single mode	AAD13403P001
	External Fiber Modem, 1300 nM single mode, with 2070-7 cable	AAZ14257P001
2070-7	Async Serial Comm Module, EIA-232, for external modem	AAD11943P001
2070-7A	Async Serial Comm Module, EIA-232, for direct connect	AAD13982P001
2070-7B	Async Serial Comm Module, EIA-485, for twisted pair	AAD13929P001
	VME Ethernet Adapter, OS/9 drivers, requires 2070-1A, 2070-5A	AAD14004P001
	VME EIA-232 Adapter, 8 channels, requires 2070-1A, 2070-5A	AAD14246P001

SOFTWARE AND ACCESSORIES

SOFTWARE:	EAGLE PART
Eagle EPAC™ Traffic Control Software	MBU14247P312
Gardner Transportation NEXTPHASE™ Traffic Control Software	MBU13995P100
Los Angeles DOT Traffic Control Software	Demo, only
Eagle VALSUITE controller self-test software (requires loop-back)	MBU14003P100
Eagle MDMTEST2 modem self-test software (requires loop-back)	MBU14024P100
Developers Software Kit, Microware FASTRAC, OS/9 editor, compiler, linker	MBU14019P001

CABLES AND ACCESSORIES:	
Loop-Back Cable, for 2070-2A Field I/O (Type 170 104 Pin Connector)	ABW12150P001
Loop-Back Cable, for 2070-8 Field I/O (NEMA A,B,C,D)	ABW12232P001
Loop-Back Cable, for 2070-7, 2070-7A EIA-232 Ports	ABW12151P001
Loop-Back Cable, for 2070-6A, 2070-6B EIA-232 Ports	ABW12152P001
Loop-Back Cable, for 2070-6A, 2070-6B FSK Lines	ABW12233P001
Loop-Back Cable, for 2070-8 EXT2, EIA-232	ABW12234P001
Loop-Back Cable, for 2070-8 EXT2, FSK Lines	ABW12235P001
Ethernet RJ-45 Cable, 6 ft, connects VME Ethernet Adapter to PC Ethernet	ABW14020P006
EIA-232 Cable, 6 ft, connects C50 to PC COM1 to load application software	ABW14021P006
EIA-232 Cable, 6 ft, connects 2070-3C C60 to PC COM1 as remote front panel	ABW14245P006
EIA-232 Cable, 6 ft, connects 2070-6 C2S or C22S to EIA-232 DB-25	ABW14256P006
FSK Cable, 10 ft, connects 2070-6 C2S or C22S to phone punch down	ABW14255P010
EIA-232 Cable, 6 ft, connects 2070-7 to AAZ14257P001 External Fiber Modem	ABW14259P006
Fiberoptic Cable, 2 meter, connects 2070-6D to fiberoptic patch panel	PBW04915P001
Adapter Cable, 6 ft, connects 2070-8 NEMA 57 pin “D” to cabinet panel	ABW14258P006
Adapter Cable, 6 ft, connects 2070-7 9-pin “D” to 2070-8 EXT2 Cable	ABW14122P006
Developers Hardware Kit, cable and software to load operating system upgrades	AAD14248P001
Datakey™ Programmer, includes software and cable to PC COM1	AAD14252P001

SESSION 2.5

MODEL 2070 CONTROLLER APPLICATIONS

BI Tran Systems, Inc.

A McCain Traffic Supply Company

GERRY BLOODGOOD

BI Tran Systems / McCain Traffic Supply

2070 CONTROLLER APPLICATIONS

- INCIDENT MANAGEMENT
- TRAFFIC SIGNAL CONTROL
- RAMP METERING

BI Tran Systems / McCain Traffic Supply

INCIDENT MANAGEMENT (OFFRAMP DIVERSION)

- VOLUME/OCCUPANCY/SPEED
- EXTINGUISHABLE MESSAGE SIGNS
- DIAL UP PAGER

BI Tran Systems / McCain Traffic Supply

TRAFFIC SIGNAL CONTROL

- PROGRAM 233 FROM MODEL 170
- TRAFFIC ADAPTIVE (OPAC)
- NEMA CABINET

BI Tran Systems / McCain Traffic Supply

RAMP METERING

- MULTIPLE LANES (6)
- TRAFFIC RESPONSIVE (V/O/S)
- 48 DETECTORS

SESSION 2.5

2070 APPLICATIONS

ECONOLITE ASC/2070 TRAFFIC CONTROL SOFTWARE

RALPH W. BOAZ

ECONOLITE ASC/2070 SOFTWARE

- **ASC/2 FAMILY OF SOFTWARE HAS BEEN ENHANCED TO TAKE ADVANTAGE OF THE PROCESSING POWER AND MULTI-TASKING 2070 ARCHITECTURE**

ECONOLITE ASC/2070 SOFTWARE

- HIERARCHICAL, INTUITIVE MENU SYSTEM
  - ON-LINE CONTEXT SENSITIVE HELP FOR EVERY SCREEN AND TOPIC
  - STATUS DISPLAYS FOR EACH OF THE CONTROLLER'S MAIN FUNCTIONS

- CONTROL FEATURES
  - 12 PHASES
  - 8 CONCURRENT GROUPS
  - 2 TIMING RINGS
  - UP TO 16 OVERLAPS

ECONOLITE ASC/2070 SOFTWARE

- **COORDINATOR FEATURES**
  - **64 PATTERNS EACH WITH OWN CYCLE, OFFSET AND SPLIT**
  - **3 INTERCONNECT METHODS: PLAN, TS2, AND STANDARD**
  - **AUTOMATIC PERMISSIVE PERIODS**
  - **FIXED OR FLOATING FORCE-OFFS**

- **PREEMPTION FEATURES**
  - **6 PRIORITY AND 4 BUS PREEMPTION SEQUENCES**
  - **OPTIONAL TRANSIT SIGNAL PRIORITY (TSP) SOFTWARE TO BE AVAILABLE**

ECONOLITE ASC/2070 SOFTWARE

- **TIME OF DAY (TOD) FEATURES**
  - **SEPARATE NON-INTERCONNECTED COORDINATION (NIC) AND TOD FUNCTIONS**
  - **16 DAY PROGRAMS**
  - **10 WEEK PROGRAMS**
  - **36 HOLIDAY PROGRAMS (FIXED OR FLOATING)**
  - **200 NIC PROGRAM STEPS**
  - **100 TOD PROGRAM STEPS**

ECONOLITE ASC/2070 SOFTWARE

- **DETECTOR FEATURES**
  - **64 VEHICLE DETECTOR INPUTS**
  - **16 SYSTEM DETECTOR INPUTS**
  - **DETECTORS INDIVIDUALLY ASSIGNABLE TO PHASE AND FUNCTIONS**
  - **LOCK/NON-LOCK FUNCTION BY DETECTOR INPUT**

ECONOLITE ASC/2070 SOFTWARE

- **COMMUNICATION FEATURES**
  - **OPEN SYSTEM PROTOCOL SUPPORT INCLUDING NTCIP AND AB3418**
  - **FULL DATABASE UPLOAD AND DOWNLOAD**
  - **RUNS DIFFERENT PROTOCOLS CONCURRENTLY ON MULTIPLE SERIAL PORTS**

ECONOLITE ASC/2070 SOFTWARE

- SOFTWARE INSTALLS IN ABOUT 8 MINUTES
  - REQUIRES NO USER INTERACTION
  - AUTO-CONFIGURES FOR 170, NEMA TS-2, NEMA TS-1 AND 2070/ITS CABINETS
  - CUSTOMIZED I/O MAPPING

SESSION 2.5

DMJM LOCAL PROGRAM

BOB RUSSO

PROGRAM FEATURES

- 16 Vehicle Phases
- 16 Pedestrian Phases
- 16 Vehicle Overlaps w/ Preemption Omission
- 16 Pedestrian Overlaps Phases
- 17 Individual Timing Functions for each phase
- Completely customizable sequencer
- Concurrent Service of 0 – 4 Rings
- Sequences containing 0 – 8 phase compatibility barriers
- Simultaneous Quad/Dual ring operation
- 38 Individually control functions and features for each phase

COORDINATION FEATURES

64 Time-Based Coordination Plans each having

- **4 Phase control Data Sets**
- **4 Phase timing Sets**
- **4 Phase Sequence Sets**
- **4 Offsets**
- **16 Dynamic Omit and 16 Recall Plans**

- **Auto-calc of Permissive Times**
- **Selectable Min cycle times during transition**
- **Pedestrian force-off adjustment**
- **Sync with main and side streets simultaneously (Cross-grids)**
- **Coordination correction using 3 selectable optimization modes**

PREEMPTION/SCHEDULER

PREEMPTION

- **8 EV with 2 priority levels**
- **4 Railroads**
- **2 Special (16 interval defined)**

SCHEDULER

- **256 TOY/TOD/DOW events**
- **3 Event priority levels**
- **Each Event can implement plans 1- 64, flash or free, and selectable options such as:**

Recall	**Max 2**	**Soft Veh/Ped Recall**	**Lead/Lag**
Min/Max Recall		**Detector Monitoring**	**Detector Counting**
Split Monitoring		**Logic Macros**	**Deactivate Outputs**

PROGRAMMABLE INPUTS

Inputs Are Assignable for the following functions:

- Pin Connections
- Force off A&B
- Min/Max Recall
- TOD/DOW Reset/Sync
- Cabinet Flash
- Free/Flash
- Door Open
- Holds
- Veh/Ped and/or System Detectors
- Manual Control Adv/Enable
- Phase Timing Back Select
- Max Inhibit
- CNA
- TBC Time Select
- Stop time
- Ext Alarms
- EVA/RR/SP Pre

PROGRAMMABLE OUTPUTS

Outputs Are Assignable for the following functions:

- **Pin Connections**
- **3 Flasher**
- **Vehicle/Pedestrian outputs**
- **4 Advanced Warning Beacons**
- **TBC Plan Status**
- **8 EVA, 4 RR and 2 Special Preemption**
- **Flash/Select/Status**
- **Cabinet Flash**
- **Watch Dog**